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MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

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THE DEVELOPMENT AND TRAJECTORIES OF TORNADOES

By J. R. LLOYD

[U. S. Weather Bureau, Washington, March, 1942]

An excellent summary of the characteristic phenomena of the tornado, and an account of its genesis and development, are given by W. J. Humphreys in his treatise *Physics of the Air*, 3 ed., pp. 218–224. The main object of the present paper is to put on record an investigation of the synoptic data for two periods in March 1938 that completely substantiates the conception of the tornado proposed by Humphreys.

Figures 1, 2, and 3 show the surface synoptic situations at three different hours on March 15, 1938. The surface cold front associated with the LOW over central Kansas was accompanied by an upper-air cold front that preceded the surface front by from 75 to 100 miles or more. This upper front resulted from Marine Polar air overrunning Marine Tropical air; see figure 4.

As shown in figure 2, by 12:30 p. m., C. S. T., the cold front aloft had, at its northern end, begun to move forward over the cold air mass at the surface to the northward and northeastward of the center of the LOW; that is, this cold air mass was shallow and was being overrun by the Marine Tropical air from the south, while this overrunning Marine Tropical air was in turn being overrun from the south-southwest by subsiding Marine Polar air that originally came from the Pacific. There is a difference of around 30 percent between the dewpoints in the Marine Polar air over the western and central portions of Missouri, Arkansas and eastern Texas, and the dewpoints in the Marine Tropical air mass to the eastward.

Figure 5 shows the upper-air soundings from El Paso and Shreveport taken at 3 a. m., C. S. T. The sounding at Shreveport shows very moist Marine Tropical air with a stable lapse rate from the surface up to a marked temperature inversion at 5,200 feet, above which is found dry Superior air with a steep lapse rate. The air column at Shreveport is convectionally quite unstable. The sounding at El Paso indicates dry subsiding Marine Polar air with evidence of considerable stratification in the lower portions of the ascent. This air mass is considerably colder than the Marine Tropical mass to the eastward at Shreveport. As this Marine Polar air mass moved eastward and descended the eastern slopes of the Rocky Mountain plateau it heated adiabatically in the lower layers but remained considerably colder aloft than the Marine Tropical air to the eastward that it displaced.

Figure 6 shows the hourly progressions of the upper-air cold front, and of the six tornadoes that occurred on it. The second tornado, which occurred about 1:30 p. m. near McPaul in extreme southwestern Iowa, is of particular interest because it formed to the northward of the center of the LOW, in the surface cold sector, and moved from southeast to northwest. When its occurrence was reported to the Weather Bureau forecast center at Chicago, the writer (then stationed at that office) at once inferred that it must have moved from southeast to northwest; this deduction was based on the hypothesis that tornadoes develop on upper-air cold fronts and move up these fronts approximately at the speed of the wind in the warm sector of the cyclone just ahead of the upper-air cold front. The cold front aloft on which the McPaul tornado occurred then lay slightly north of west by slightly south of east, and in that locality was moving slowly northward with winds in the warm air ahead of it blowing from the east-southeast. The writer's deduction was later confirmed by the Weather Bureau section director of the State of Iowa in reply to a request for information on the McPaul tornado, as follows: "One of the most interesting things about this tornado, and it appears that it was truly a tornado, is the fact that it moved from southeast to northwest. I cannot recall any other such direction of tornado movement in Iowa." This section director had had many years of experience in that state prior to the occurrence of the McPaul tornado.

The trajectories of all the other tornadoes that occurred in connection with the upper-air cold front of March 15 were from southwest to northeast; the portion of the cold front on which these five tornadoes occurred lay generally north-south; the winds behind the cold front blew from a general westerly direction, and the winds ahead of the front blew from a general southerly direction. It should be noted particularly that the trajectory of the first tornado curved from due northeastward to northward in Illinois toward the end of its existence, corresponding to a change in the orientation of the upper-air cold front from a north-south direction, where the tornado originated, to a northwest-southeast direction.

Figures 7 to 12, inclusive, are corresponding charts for the conditions on March 30, 1938, when no fewer than 12 tornadoes occurred. On this occasion, the LOW centered over central Kansas, was accompanied by a surface cold front extending southward through Oklahoma and thence southwestward through western Texas, with an upper-air cold front curving southeastward to near Wichita and thence south-southwestward through central Texas, some 100 to 200 miles in advance of the surface front. The difference between the dewpoints in the Marine Polar air mass to the west of the cold front and in the Marine Tropical air mass to the eastward is even more marked than on the weather maps of March 15, and the tornadoes that occurred in connection with this cold front were more numerous and more violent. It will be noted in figure 10 that the winds in the Polar Pacific air mass are for the most part blowing directly from the west, while the winds in the Marine Tropical air mass in advance of the front are blowing from the south and southwest and at higher velocities.

The sounding from Shreveport, figure 11, shows very moist Marine Tropical air up to a temperature inversion at 5,400 feet, above which is found dry Superior air,

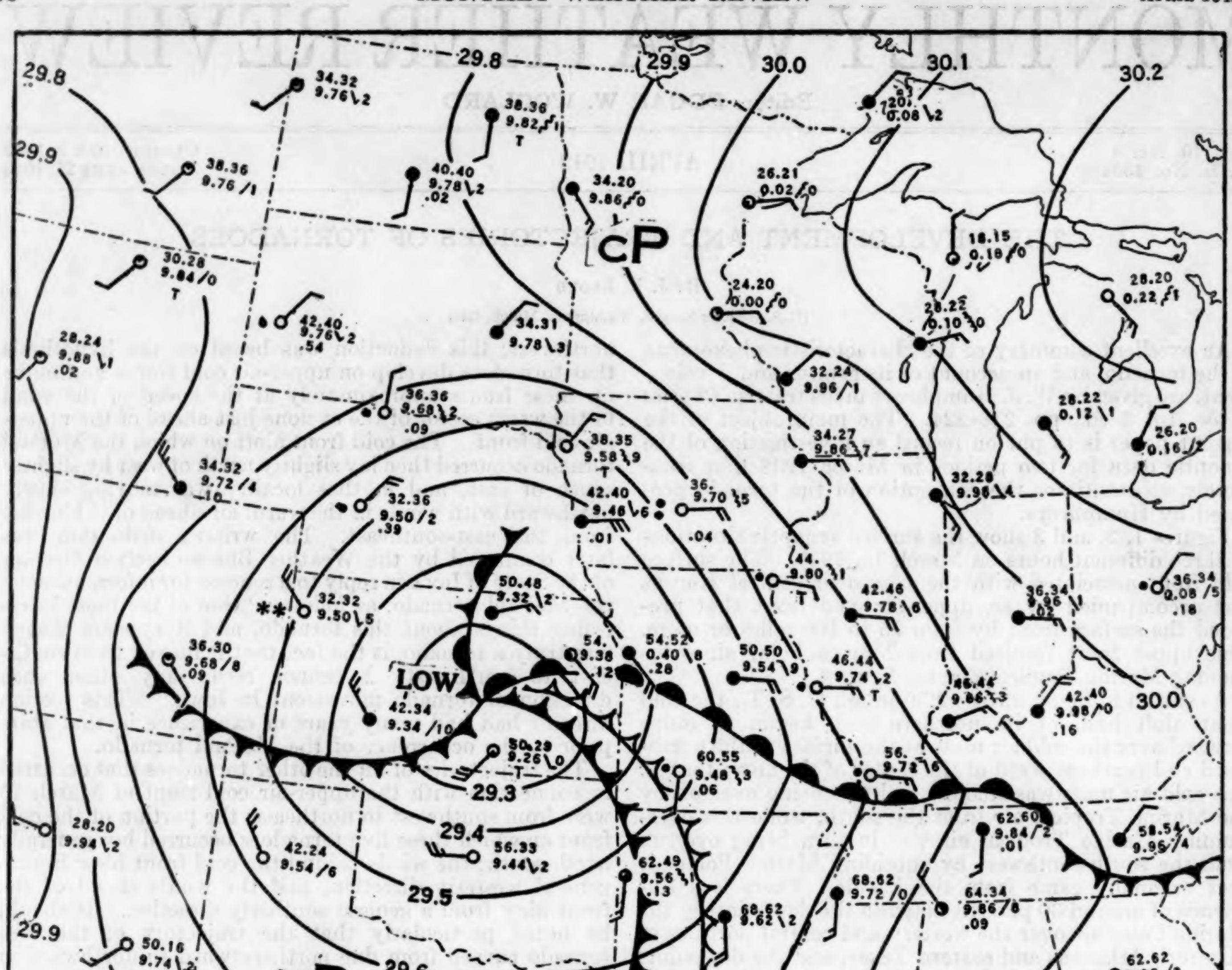


FIGURE 1.—Surface synoptic conditions, March 15, 1938, at 6:30 a. m., C. S. T.

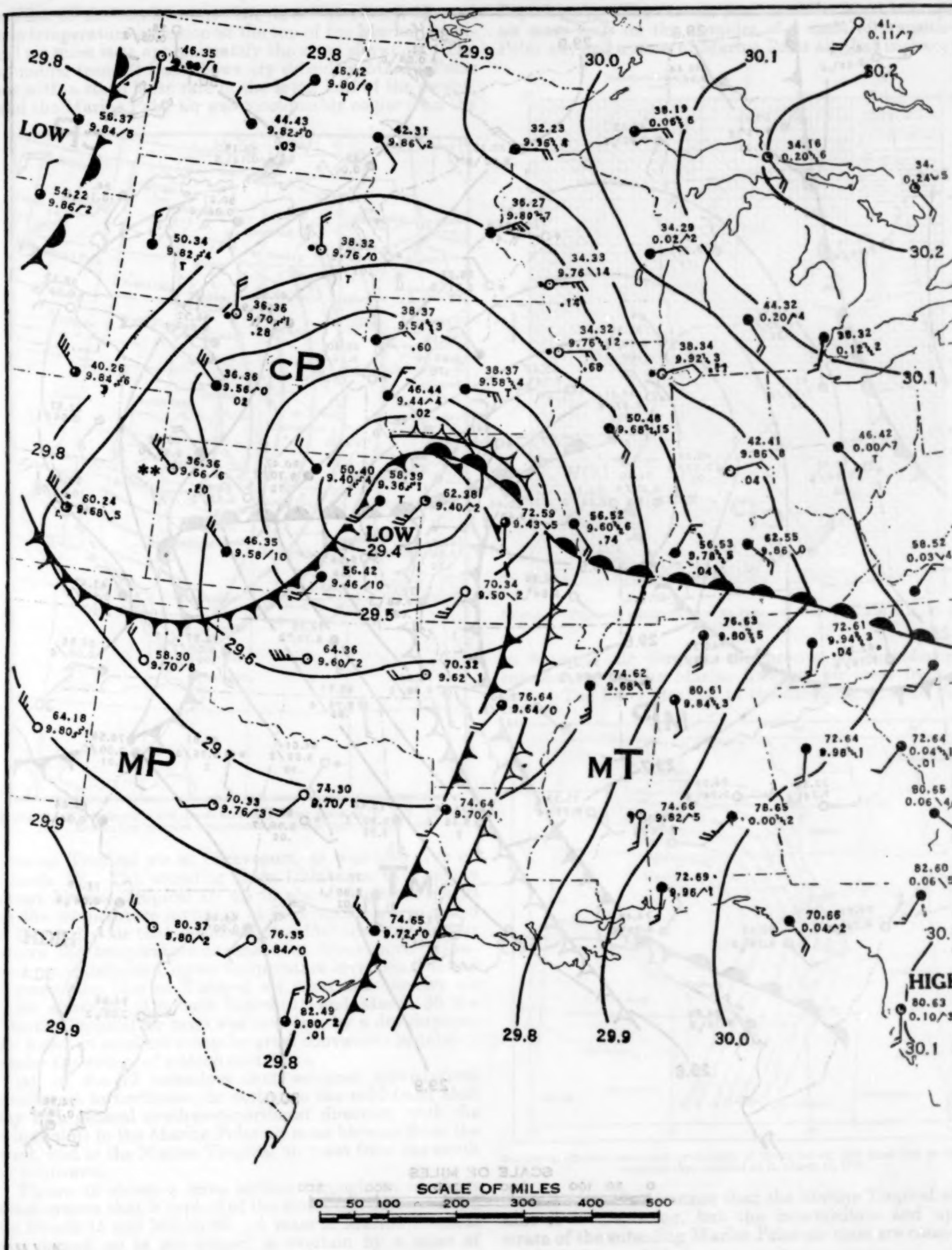


FIGURE 2.—Surface synoptic conditions, March 15, 1938, at 12:30 a. m., C. S. T.

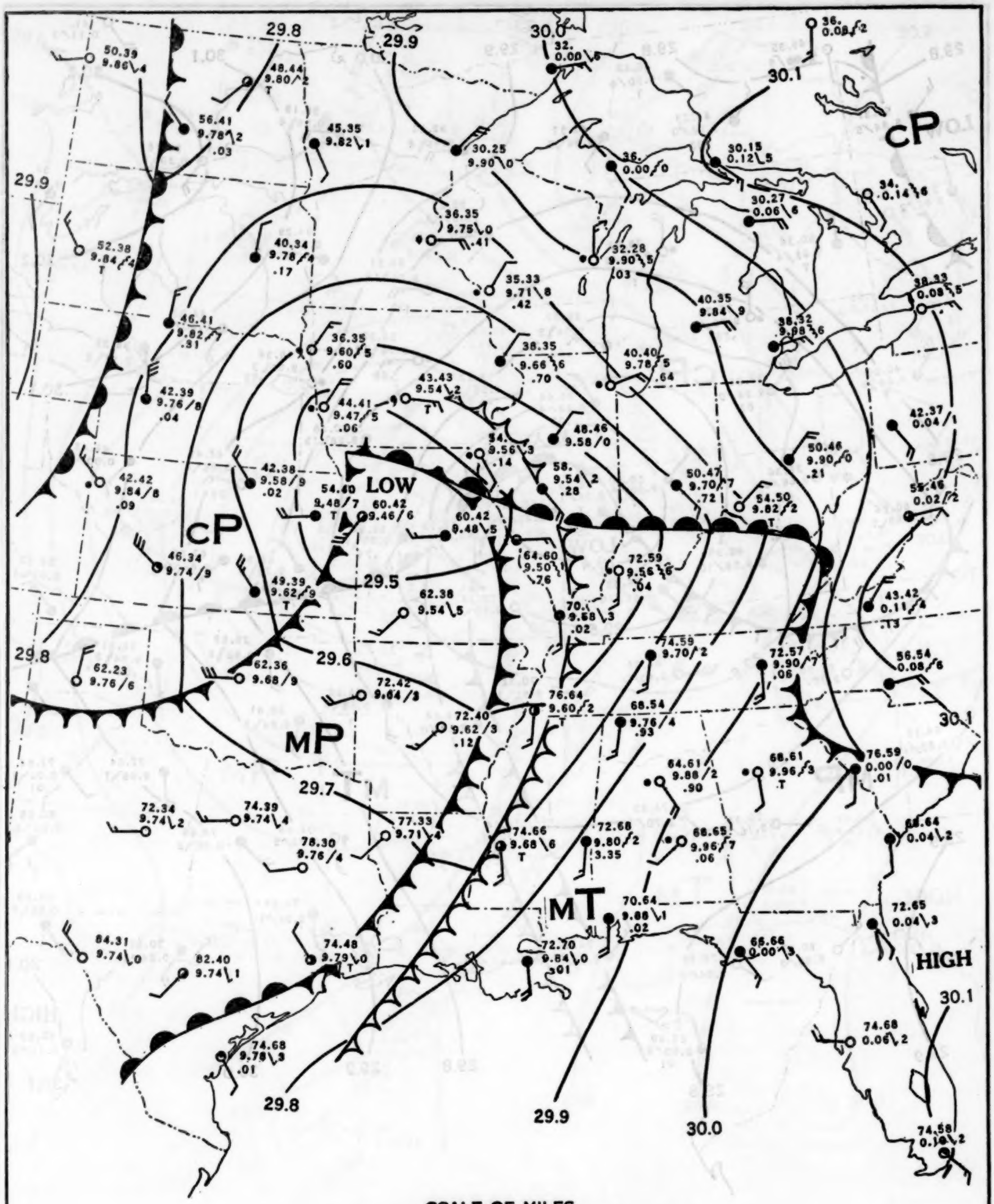


FIGURE 3.—Surface synoptic conditions, March 15, 1938, at 6:30 p. m., C. S. T.

similar to the condition at Shreveport on March 15; and the temperature inversion at the top of the Marine Tropical air mass is at approximately the same elevation. The sounding from El Paso shows dry subsiding Marine Polar air with a steep lapse rate in the lower half of the ascent, and the Marine Polar air was considerably colder than the

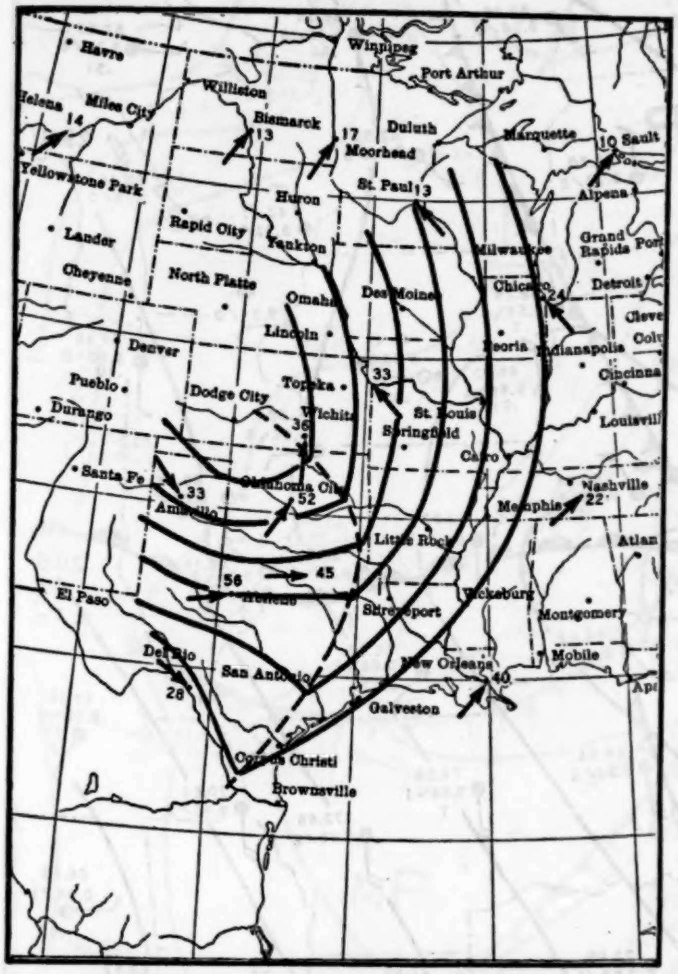


FIGURE 4.—Wind directions and speeds aloft at 4,000 feet, 4:00 a. m., C. S. T., March 15, 1938. Broken line indicates approximate position of upper-air cold front.

Marine Tropical air at Shreveport, as was also true on March 15. The sounding from Oklahoma City shows moist Marine Tropical air up to about the same height as the temperature inversion at Shreveport, above which is found dry air that is somewhat colder than the dry air above the temperature inversion at Shreveport. However, at Oklahoma City no temperature inversion is found between the Marine Tropical air mass and the dry air mass above it. On both March 15 and March 30 the Marine Tropical air mass was over-lain by a dry Superior air mass, an excellent setup for great convective instability under the action of a steep cold front.

All of the 12 tornadoes that occurred moved from southwest to northeast; in each case the cold front aloft lay in a general southwest-northeast direction, with the winds aloft in the Marine Polar air mass blowing from the west, and in the Marine Tropical air mass from the south or southwest.

Figure 13 shows a cross section through an ideal air mass system that is typical of the situations that occurred on March 15 and March 30. A mass of Marine Tropical air, domed up in the center, is overlain by a mass of Superior air. The eastern portion of the Marine Tropical air mass rests on the shoulder of a mass of transitional Polar air, and a mass of Marine Polar air that is changing

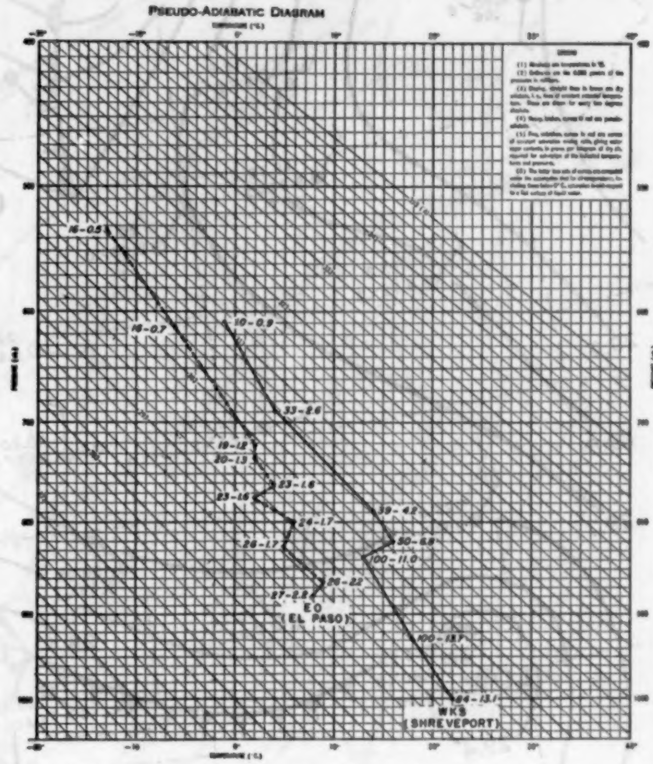


FIGURE 5.—Upper-air soundings from El Paso and Shreveport, 3:00 a. m., C. S. T. March 15, 1938.

to Superior air through the process of subsidence is encroaching on the Marine Tropical air mass from the west. The lower stratum of the subsiding Marine Polar

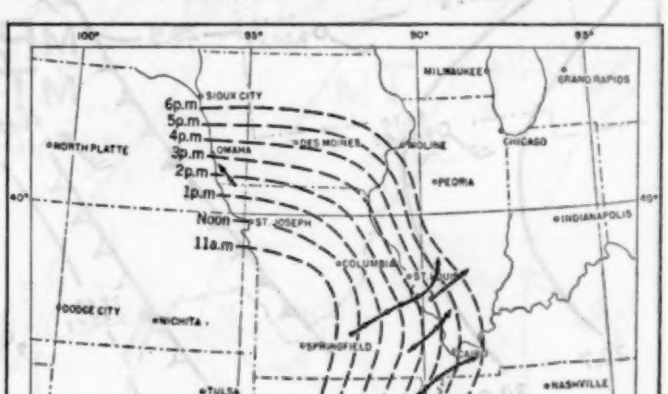


FIGURE 6.—Development and progression of the upper-air cold front and of the six tornadoes that occurred on it, March 15, 1938.

mass is somewhat warmer than the Marine Tropical mass that it is displacing, but the intermediate and upper strata of the subsiding Marine Polar air mass are consider-

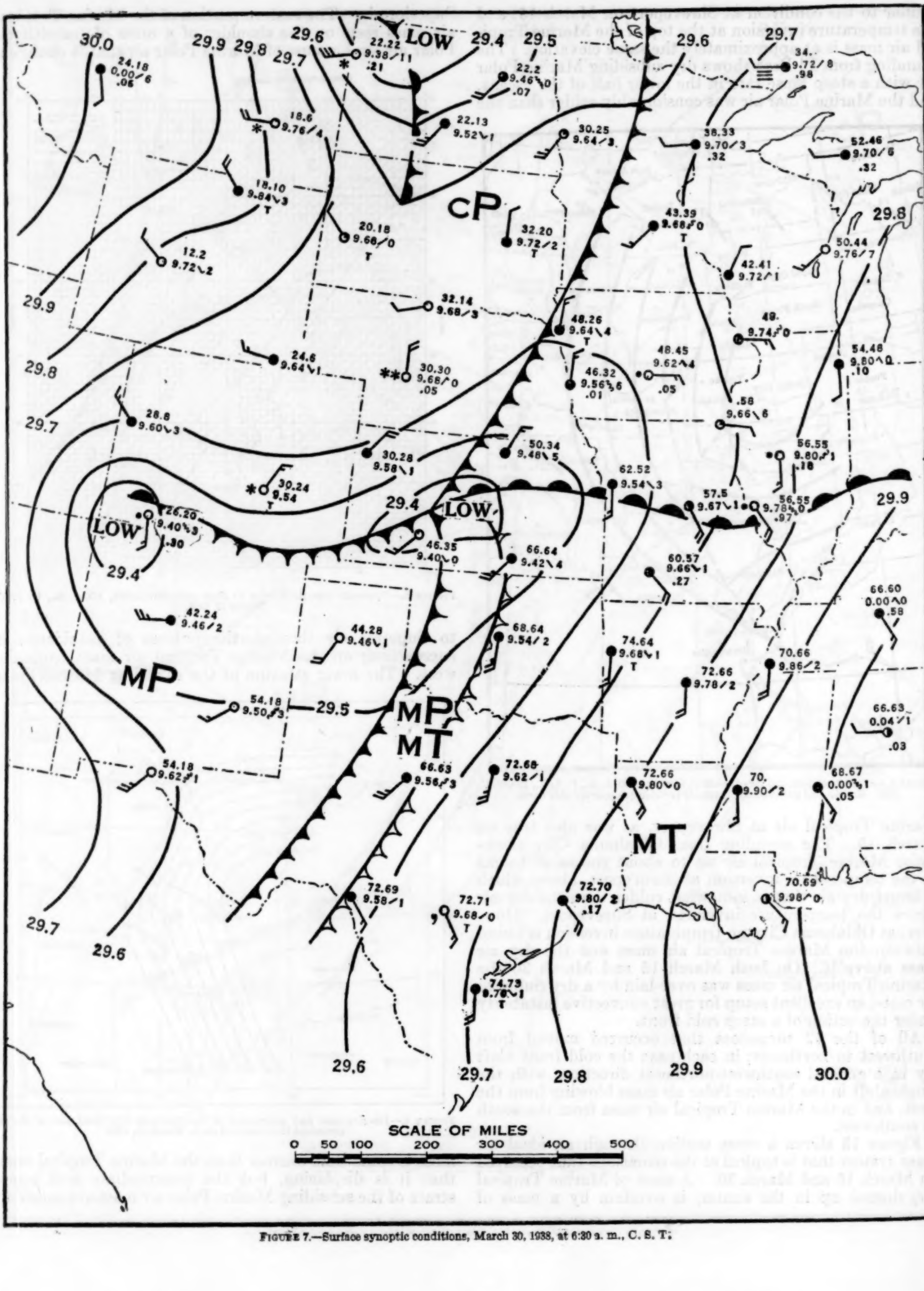


FIGURE 7.—Surface synoptic conditions, March 30, 1938, at 6:30 a. m., C. S. T.

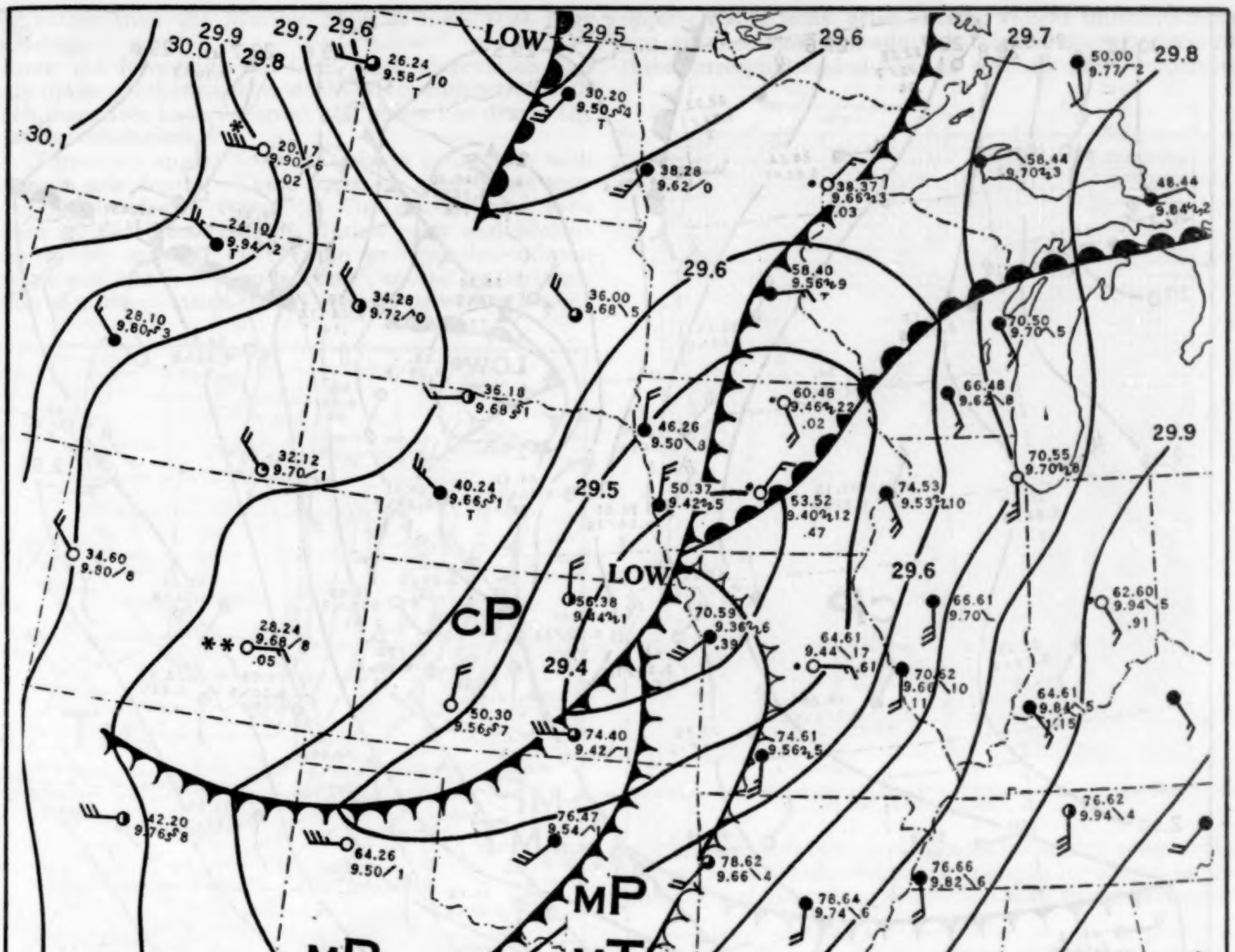


FIGURE 8.—Surface synoptic conditions, March 30, 1938, at 12:30 p. m., C. S. T.

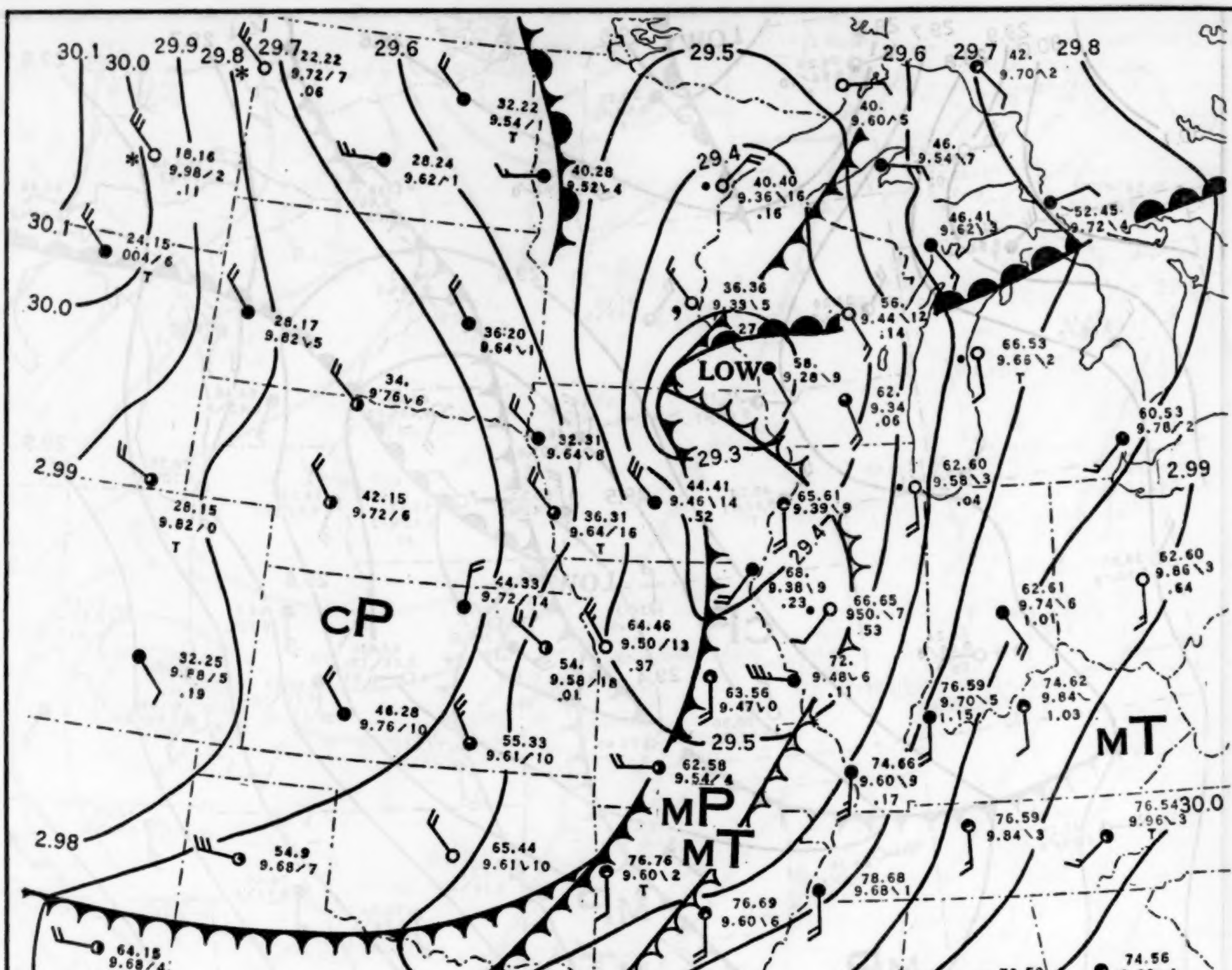


Figure 9.—Surface synoptic conditions, March 30, 1938, at 6:30 p. m., C. S. T.

ably colder than the Marine Tropical mass that it is displacing.

From the foregoing, and from close observation and study of many other weather situations in connection with which tornadoes have occurred, the writer has drawn the following conclusions:

1. Tornadoes appear to occur only in connection with upper-air cold fronts. These upper-air cold fronts may be of either of two types: (1) The conventional type caused by the interaction of Marine polar and Marine Tropical air masses; or (2) the precipitation-induced type, or pre-cold-frontal squall line [1], caused by the interaction of a precipitation-cooled mass of air with a Marine

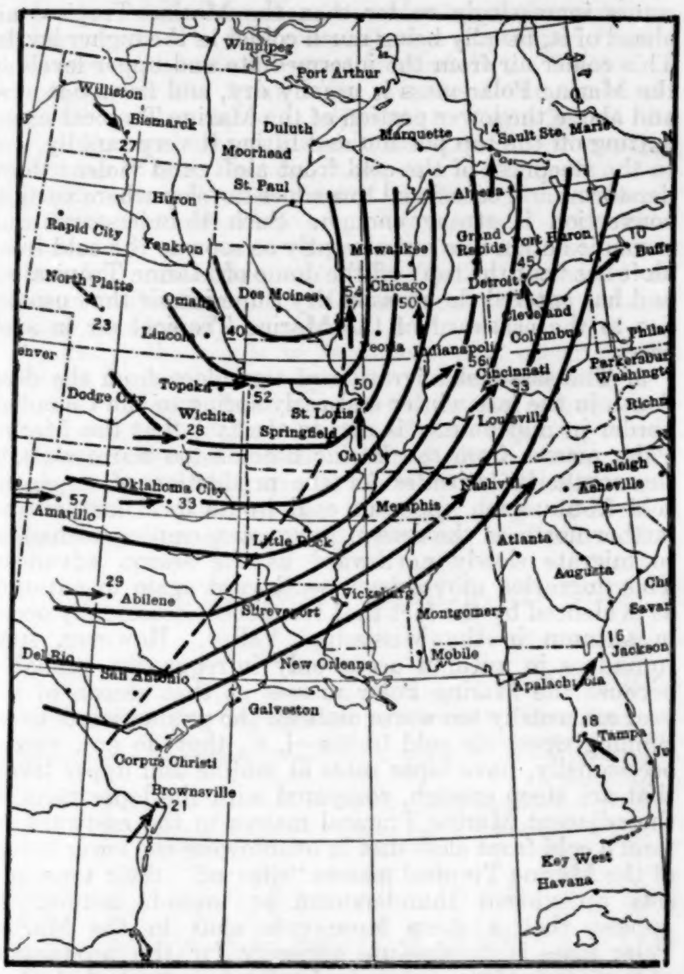


FIGURE 10.—Wind directions and speeds aloft at 4,000 feet, March 30, 1938, at 4 p. m., C. S. T. Broken line indicates approximate position of upper-air cold front.

Tropical air mass. The latter type always occurs in connection with thunderstorms which appear to be set up in connection with pre-cold-frontal horizontal convergence in a Marine Tropical air mass. The rain and hail that occur in the thunderstorms generated in the pre-cold-frontal zone cool the air through which they fall, particularly in the upper and middle levels, to considerably below the temperature of the air in the Marine Tropical air mass ahead, where no precipitation has yet occurred. There is thus built up a mass of denser air aloft that usually moves along rapidly, developing a squall line that exhibits most of the characteristics of a true air mass upper-air cold front, often causing violent thunderstorms and an occasional tornado. A marked characteristic of these precipitation-induced or "squall line" upper-air

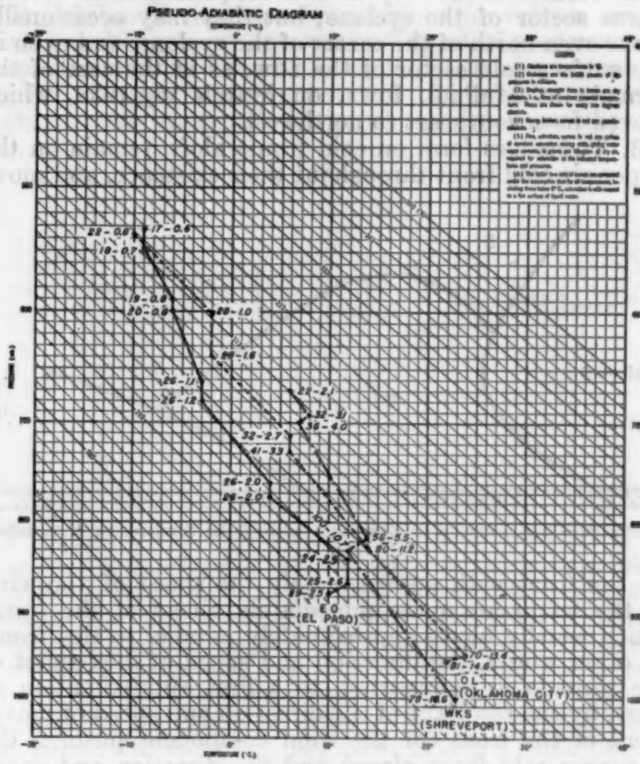


FIGURE 11.—Upper-air soundings from El Paso, Oklahoma City and Shreveport, March 30, 1938, at 3:00 a. m., C. S. T.

cold fronts is that they dissipate in a few hours, whereas the true upper-air cold front usually persists for several hours. Tornadoes that occur in connection with true mass upper-air cold fronts usually occur in groups or families numbering anywhere from 2 or 3 to as many as 12 or 15 in connection with a single front; while tornadoes that occur

FIGURE 12.—Development and progression of tornadoes on upper-air cold front, March 30, 1938, C. S. T.

[1] H. T. Harrison and W. K. Orrendorf on the "Pre-Coldfrontal Squall Line" in Meteorological Circular No. 16 of the U. A. L. T. C. Meteorology Department, March 1, 1941.

in connection with precipitation-induced cold fronts, or pre-cold-frontal squall lines, usually occur singly or occasionally in pairs.

2. Tornadoes occur by far most frequently in the surface warm sector of the cyclone; but they may occasionally occur even north of the center of the cyclone, and even in the surface cold sector of the LOW, as in the case of the tornado at McPaul, Iowa, on March 15, 1938, which moved from southeast to northwest.

3. Tornadoes form on cold fronts aloft, remain on the upper-air cold front throughout their existence, and move

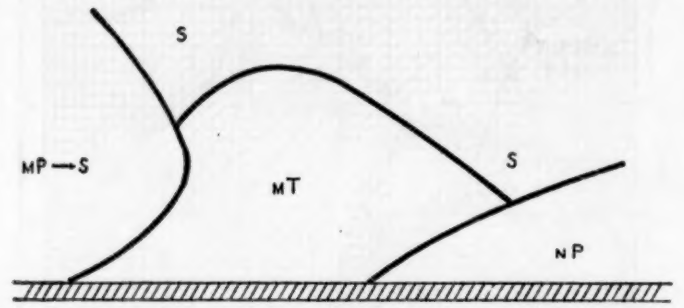


FIGURE 13.—Cross section of air-mass setup favorable for development of tornadoes.

up the front with approximately the speed of the wind in the warm air mass immediately ahead of the front, which usually blows approximately parallel to this front. In other words, the direction and speed of movement of the tornado is represented, to a first approximation at least, by the resultant of the direction and speed of movement of the front (or the wind component pushing the upper-air cold front along) and the direction and speed of the wind immediately ahead of the upper-air cold front, as shown in figure 14. The heavy curved line in figure 14A indicates the usual relative position of a cold front aloft in the great central valleys, with winds behind the

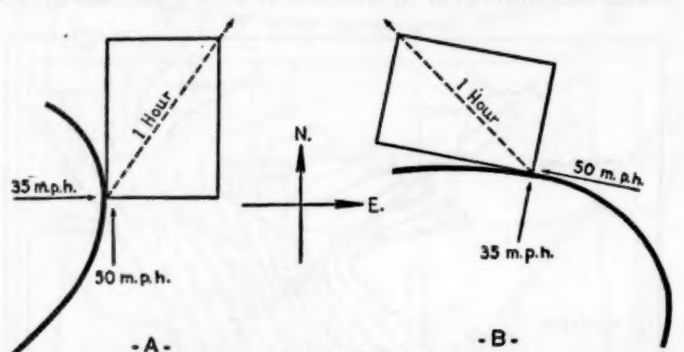


FIGURE 14.—Determination of the rate and direction of motion of a tornado: (A), the usual conditions, resulting in a trajectory from southwest to northeast; (B), the conditions resulting in the exceptional McPaul tornado.

front blowing from the west, and winds ahead of the front blowing from the south, always resulting in a tornado trajectory from southwest to northeast. The heavy curved line in figure 14B indicates the relative position of the cold front aloft that occurred in connection with the McPaul, Iowa, tornado. The converging winds from the south-southwest behind the front and from the east-southeast winds ahead of the front resulted in a tornado trajectory from southeast to northwest. The winds in the colder air mass behind the upper air cold front may flow approximately normal to the front, or almost parallel to it over a portion of the front, but the winds in the warm-air mass ahead of the front on which a tornado will develop usually flow approximately parallel to the upper air cold front along a considerable length of the front.

4. The lapse rate in the cold Marine Polar air mass to the westward of the warm, moist Marine Tropical mass is about the same as the lapse rate in the Marine Tropical mass to the eastward, and has about the same temperature up to some 1½ kilometers, above which the lapse rate is considerably steeper in the Marine Polar mass than in the Marine Tropical mass to the eastward. During the day the Polar mass, which has really become a Superior mass due to subsidence, becomes warmer in its lower levels up to 3,000 or 4,000 feet than the Marine Tropical air mass ahead of it. Above the level where the lapse rate in the Marine Polar mass begins to steepen sharply, the air becomes increasingly colder than the Marine Tropical air ahead of it, usually being much colder in the higher levels. This colder air from the intermediate and upper levels in the Marine Polar mass is usually dry, and flows out over and above the lower portion of the Marine Tropical mass; cutting off the top portion and lifting it very rapidly, due to the steepness of the cold front aloft; and violent thunderstorms and occasional tornadoes develop where vertical convection is strong enough. Such thunderstorm and tornadic action dies out abruptly as soon as the cold front aloft has "cut the top" off the dome of Marine Tropical air and has entered the mass of dry Superior air that usually lies to the eastward of the Marine Tropical air in such cases.

5. The seasonal migration of tornadoes from the deep South in the late winter and early spring to the Canadian border in midsummer is due to the fact that the Marine Polar masses from the Pacific become too warm aloft in the southerly latitudes for the production of upper-air cold fronts; such upper-air cold fronts form farther and farther north as the season progresses, causing tornadoes to migrate slowly northward as the season advances. This migration moves back southward again in autumn, as evidenced by the fact that tornadoes occasionally occur in autumn in the Mississippi Valley. However, such tornadoes in autumn occur only infrequently, probably because the Marine Polar masses at that season of the year are usually too warm aloft for the production of overrunning upper-air cold fronts—i. e., they do not, except occasionally, have lapse rates at middle and upper levels that are steep enough, compared with the lapse rates in the adjacent Marine Tropical masses to the eastward, to form a cold front aloft that in overflowing the lower layers of the Marine Tropical masses "clips off" their tops and sets up violent thunderstorm or tornado action. It appears that a steep lapse rate aloft in the Marine Polar mass is an absolute necessity for the production of tornadoes of the group or family type and that they occur only in connection with Marine Polar cold fronts. The writer has yet to find a tornado of the group or family type that has been caused by the interaction of Continental Polar and Marine Tropical air masses.

6. The rotation of the winds in the funnel cloud of the tornado must always be counterclockwise in the Northern Hemisphere, not due to the fact that the rotation of the earth prevents tornado vortices from whirling clockwise (since the vortices of waterspouts and dust whirls may whirl either clockwise or counterclockwise), but due to the fact that the movement of the air in the Marine Tropical masses in the Northern Hemisphere is always from a southerly direction, and to the right of the Marine Polar masses from the eastern sides of which the upper-air cold fronts originate and in which the air movement is usually from a westerly quarter.

Under these conditions, the southeasterly components of the southerly winds in the Marine Tropical masses interact with the northwesterly components of the westerly winds in the Marine Polar masses, to form vortices that necessarily must always have counterclockwise motion, as shown in figure 15A. Another way in which it is thought that tornado vortices may be—and, in the writer's judgment, perhaps usually are—formed is shown in figure 15B. Here, as the winds from the west in the Marine Tropical air mass approach the cold front they are slowed down considerably and deflected to the left, due to frictional drag as they come in contact with the wall of Marine Tropical air that is moving rapidly from a southerly direction. The winds in the Tropical air mass immediately in advance of the cold front usually move with higher speed, due to pre-cold frontal convergence, than do the westerly winds in the Polar mass converging on the front. The Marine Polar air would then flow alongside and adjacent to the edge of the Marine Tropical air mass, and in the same direction as the flow of the Marine Tropical mass, at a speed considerably less than the northward speed of the Tropical air. Swirls would therefore develop at points along the interface between the two air masses, and where these swirls occurred in connection with the rapidly ascending air currents on the edge of the Marine Tropical mass, tornado vortices could easily be set up.

Similarly, the winds in tornadoes that occur in the Southern Hemisphere always have clockwise motion.

7. The violence of the tornado will depend largely upon three factors: (1) The strength of the opposing winds immediately behind and immediately ahead of the front which set up the whirl around the vortex, (2) the area and degree of saturation of the uprushing mass of Marine Tropical air that is disturbed by strong local convection on the cold front aloft, and which is acted on by the opposing frontal winds to induce the spiral, upward counterclockwise motion in the funnel cloud; and (3) the steepness of the cold front aloft.

It is believed that these conclusions provide a sound basis on which the trajectories and speed of movement of tornadoes can be forecast *once they have been formed.* If, for example, a dense network of tornado-reporting stations were organized, by which a large percentage of

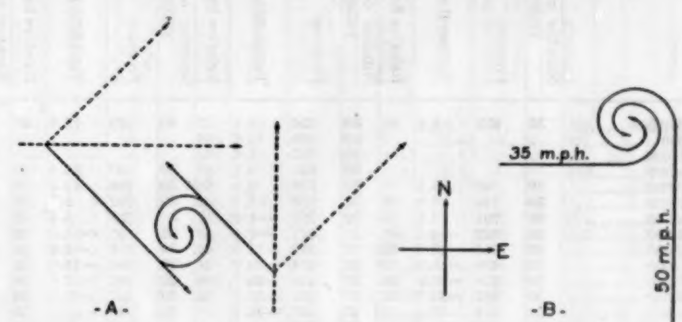


FIGURE 15.—Illustration of theoretical concept of development of tornado vortices.

the tornadoes that occur during daylight hours could be observed and reported immediately by telephone to a forecast district center in the area, it would be possible to forecast the approximate trajectory and speed of movement of a tornado, once it had been observed. Warning could be given of the approach of tornadoes and severe squall line thunderstorms only for periods of 15 or 20 minutes to perhaps 2 or 3 hours in advance; but commercial air-line operators and other interests vitally interested in such storms, and the general public would profit to that extent.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR APRIL 1942

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during April 1942*

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho. (864 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	834	12.9	45	30	984	17.9	57	30	953	7.3	73	30	911	10.9	60	30	1,013	21.8	84	30	991	7.7	72	30	1,018	14.9	84
500					30	962	17.6	51									30	956	19.4	82	30	959	9.8	65	30	962	17.1	60
1,000					30	907	14.4	50	30	898	7.3	66	30	897	12.1	56	30	903	18.0	65	30	902	7.5	63	30	907	11.1	55
1,500					30	854	11.6	48	30	844	5.3	63	30	844	9.8	54	30	852	16.8	56	30	849	4.8	66	29	854	10.9	52
2,000	30	797	12.0	45	30	804	8.7	48	30	794	3.5	62	30	795	5.8	55	30	802	15.2	46	30	798	2.1	68	29	804	7.7	50
2,500	30	750	8.4	45	30	757	5.8	48	30	746	1.1	62	30	747	1.7	60	30	756	13.0	37	30	750	−0.7	68	29	757	5.4	49
3,000	30	706	4.4	48	30	712	2.7	46	30	701	−1.5	60	30	702	−2.2	64	30	712	10.2	33	30	704	−3.2	66	29	712	2.7	45
4,000	30	623	−3.6	53	30	628	−3.1	40	29	618	−7.6	59	30	618	−9.2	66	30	631	3.7	33	30	620	−8.8	60	28	628	−3.3	41
5,000	28	548	−11.0	57	27	553	−9.5	35	29	543	−14.2	55	29	542	−15.9	64	28	557	−3.8	36	30	544	−15.0	54	28	553	−9.4	41
6,000	28	481	−17.8	54	27	485	−16.6	33	29	474	−21.3	53	29	474	−22.8	60	28	490	−11.2	39	30	476	−21.1	50	28	485	−16.4	39
7,000	27	420	−24.4	50	27	424	−23.7	32	28	413	−28.8	50	29	413	−29.7	59	27	430	−18.1	37	30	415	−28.6	48	28	424	−23.7	38
8,000	27	364	−32.0	48	27	369	−31.1	31	27	359	−36.4	49	29	358	−36.5	58	27	375	−25.0	35	30	360	−35.9	47	27	369	−31.0	37
9,000	26	316	−38.7		26	319	−38.6	30	27	310	−43.9		29	309	−43.6		26	326	−32.0	33	30	311	−43.0		27	320	−38.4	35
10,000	26	273	−45.5		25	276	−45.5		27	266	−51.2		29	266	−50.0		25	283	−39.2		30	267	−49.8		27	275	−45.5	
11,000	24	235	−51.9		25	237	−51.4		26	228	−56.4		28	228	−55.7		25	244	−46.8		30	229	−55.0		27	238	−52.0	
12,000	23	201	−56.3		23	203	−56.8		26	195	−59.4		28	194	−58.9		22	210	−54.1		30	196	−58.9		26	203	−56.5	
13,000	20	171	−58.9		23	173	−59.7		25	166	−60.2		28	166	−59.3		19	179	−59.9		30	167	−60.4		26	173	−59.1	
14,000	19	145	−59.8		22	147	−60.3		24	141	−57.8		26	141	−57.9		17	152	−64.1		28	142	−58.7		25	148	−60.0	
15,000	19	124	−61.4		21	125	−61.6		21	120	−57.5		26	120	−57.3		17	129	−68.7		28	121	−58.4		23	126	−61.3	
16,000	18	105	−62.0		18	106	−62.7		17	102	−57.8		23	103	−58.0		15	109	−71.4		26	103	−58.7		22	107	−62.6	
17,000	15	89	−62.1		16	90	−63.2		10	87	−58.1		20	88	−58.0		11	92	−73.3		19	88	−58.8		16	91	−63.0	
18,000	12	76	−61.3		7	77	−63.6		6	74	−58.0		10	75	−57.5		10	78	−73.1		8	75	−59.2		14	78	−62.2	
19,000	10	64	−61.5														6	66	−70.1						6	66	−61.6	

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during April 1942*—Continued

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Denver, Colo. (1,616 m.)				Detroit, Mich. (194 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,128 m.)				Huntington, W. Va. (172 m.)				Joliet, Ill. (178 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	833	8.8	62	30	994	8.4	75	30	878	16.6	37	30	805	5.1	58	29	882	8.1	51	30	998	11.5	71	30	996	9.6	72
500					30	958	10.6	64													30	960	14.8	50	30	959	12.0	64
1,000					30	902	8.4	61													30	905	12.1	57	30	903	10.3	60
1,500					30	849	6.1	61	30	847	16.6	35					29	843	7.8	49	30	852	8.4	59	30	850	7.7	57
2,000	30	796	9.5	55	30	798	3.8	58	30	798	13.2	34	30	796	6.4	57	29	793	4.4	50	30	802	5.2	59	30	800	5.5	54
2,500	30	749	6.4	54	30	750	1.2	55	30	752	9.1	35	30	749	4.2	53	29	746	0.8	52	30	754	2.5	55	30	752	3.0	52
3,000	30	704	2.9	55	30	705	—1.3	51	30	707	5.4	37	30	704	0.2	54	29	700	—3.0	53	30	708	—0.4	55	30	707	0.6	49
4,000	30	622	—4.5	61	29	621	—7.5	43	30	625	—1.8	40	30	620	—7.4	55	29	616	—10.0	55	30	624	—6.1	52	30	623	—5.0	47
5,000	30	546	—12.0	63	27	546	—14.0	42	30	550	—8.9	41	30	545	—13.9	53	29	541	—16.2	53	30	549	—12.0	49	30	548	—11.8	45
6,000	30	479	—18.7	60	27	478	—20.9	41	30	483	—15.8	38	30	477	—20.5	50	29	473	—22.9	50	30	481	—19.0	46	30	480	—18.3	41
7,000	30	418	—25.9	56	27	416	—28.0	40	30	422	—22.8	36	30	416	—27.5	48	27	412	—30.3	48	30	419	—26.1	43	30	420	—25.3	40
8,000	30	363	—33.5	55	27	361	—35.3	39	30	367	—30.2	34	30	361	—34.4	47	26	356	—37.5	47	30	365	—38.3	42	29	364	—33.8	39
9,000	30	314	—41.5		27	312	—42.4		29	318	—37.6	32	28	312	—41.8		25	308	—44.9		30	315	—40.6		29	315	—40.6	
10,000	30	270	—48.9		27	268	—49.3		29	275	—44.8		28	269	—48.3		25	264	—51.9		30	272	—47.4		29	272	—48.3	
11,000	29	232	—55.1		26	230	—55.1		29	236	—51.5		27	231	—53.8		24	227	—56.5		30	233	—54.2		29	233	—55.4	
12,000	28	198	—59.1		24	197	—59.5		29	202	—56.9		26	197	—57.4		23	194	—58.5		29	199	—60.3		29	199	—61.3	
13,000	28	168	—59.1		23	167	—60.8		29	172	—59.7		26	168	—58.0		21	165	—58.1		29	169	—62.7		29	169	—62.5	
14,000	27	144	—58.5		23	142	—59.9		28	147	—60.7		26	144	—57.3		20	141	—56.9		27	144	—61.9		29	144	—61.4	
15,000	25	122	—58.6		19	121	—59.2		26	125	—62.2		22	122	—57.3		20	120	—56.5		26	122	—61.5		29	123	—60.5	
16,000	22	104	—59.4		15	103	—59.1		24	106	—63.5		20	104	—58.3		18	103	—56.9		25	104	—62.1		27	104	—60.6	
17,000	19	89	—59.0		9	88	—58.7		19	90	—64.3		12	89	—58.4		14	88	—57.7		23	88	—62.8		23	89	—60.8	
18,000	9	76	—58.0						13	76	—64.4						8	75	—57.7		14	75	—62.2		12	76	—59.7	
19,000									8	64	—62.8										8	64	—60.7					

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Lake Charles, La. (6 m.)				Lakehurst, N. J. (1) (39 m.)				Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va. (1) (10 m.)				Oakland, Calif. (2 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1016	17.8	90	29	1013	9.9	64	30	965	12.1	56	29	1017	19.6	81	30	997	15.6	64	27	1018	12.6	68	30	1014	13.0	75
500	30	959	16.6	80	29	958	11.0	52	30	954	11.9	55	29	961	18.5	76	30	960	16.5	58	27	960	12.5	57	30	956	10.0	75
1,000	30	904	14.8	68	29	902	8.8	50	30	898	8.9	56	29	906	15.0	75	30	906	13.7	56	27	904	10.2	53	30	900	8.4	70
1,500	29	852	13.3	58	29	849	5.7	53	30	845	5.0	62	29	854	12.6	69	30	853	10.5	57	27	851	7.1	54	30	847	6.6	62
2,000	29	803	11.0	54	29	798	2.7	52	30	794	1.1	69	29	805	10.9	57	30	803	7.6	58	26	800	4.2	54	30	796	4.2	58
2,500	29	756	8.8	50	29	750	—.4	54	30	746	—2.0	69	29	758	8.5	49	30	756	5.1	56	26	752	0.8	53	30	748	1.8	51
3,000	29	711	5.9	45	29	704	—3.5	54	30	700	—5.1	65	29	713	6.2	43	30	710	2.4	54	26	706	—2.3	51	30	703	—0.7	47
4,000	29	629	.7	39	29	620	—8.9	50	29	616	—10.4	53	29	630	1.2	32	30	627	—3.2	52	25	622	—7.9	44	30	620	—6.6	45
5,000	29	554	—5.5	38	29	544	—15.0	48	29	540	—16.7	51	27	556	—4.8	27	29	552	—9.2	46	25	546	—13.9	39	30	544	—13.4	44
6,000	29	487	—12.8	37	29	476	—21.8	51	29	472	—23.5	52	26	489	—11.0	26	29	484	—16.0	44	24	478	—20.7	38	30	477	—19.8	44
7,000	29	426	—20.2	36	29	414	—28.7	54	29	411	—30.5	51	26	429	—17.7	25	29	423	—23.3	42	22	416	—28.0	39	30	416	—27.1	44
8,000	29	372	—27.3	36	29	360	—35.9	54	29	356	—37.6	51	26	374	—24.8	25	29	368	—30.8	42	6	362	—35.6		30	361	—34.5	43
9,000	29	323	—34.7	35	29	311	—42.7		29	307	—44.2		26	325	—31.9	24	29	319	—38.4	41	6	313	—42.9		30	312	—41.5	
10,000	29	279	—41.9		27	267	—48.9		29	264	—50.2		26	282	—39.3	24	29	275	—46.1		5	269	—50.5		28	269	—48.1	
11,000	29	240	—49.1		27	230	—54.1		29	226	—55.3		25	243	—46.1		29	236	—53.1		5	230	—57.3		28	231	—53.6	
12,000	29	206	—55.9		23	196	—57.1		29	194	—58.1		25	209	—52.6		29	202	—58.5						25	197	—57.5	
13,000	28	176	—61.2		22	168	—58.5		29	165	—57.7		24	178	—58.0		29	172	—61.9						24	168	—59.1	
14,000	27	149	—63.6		20	143	—58.0		26	141	—56.8		24	152	—62.3		29	146	—61.7						21	143	—57.5	
15,000	27	126	—65.5		19	122	—57.9		25	120	—57.5		22	129	—65.8		28	124	—61.8						18	122	—57.7	
16,000	23	108	—67.2		18	104	—58.2		20	103	—58.2		21	110	—68.7		28	106	—62.6						16	104	—59.2	
17,000	20	91	—67.9		10	88	—58.5		16	88	—58.8		20	93	—70.6		26	90	—62.8						13	89	—59.8	
18,000	10	77	—66.9						9	75	—57.9		20	78	—70.1		18	76	—62.0						7	75	—59.3	
19,000	5	65	—65.9										12	66	—68.4		12	65	—61.0									
20,000													8	56	—65.8													

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during April 1942*—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Pensacola, Fla. (1) (24 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine (20 m.)				St. Louis, Mo. (171 m.)				St. Paul, Minn. (225 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	967	15.2	78	30	979	12.7	60	29	1,017	17.9	77	29	970	19.0	44	30	1,013	4.5	79	30	997	14.3	65	28	969	11.2	65
500	30	955	15.8	74	30	957	13.4	56	29	962	16.5	54	29	952	21.1	39	30	956	6.4	64	30	959	14.8	60	28	957	11.9	60
1,000	30	901	14.5	65	30	901	11.5	55	29	907	14.5	42	29	899	17.9	36	30	899	4.1	63	30	904	12.4	57	28	902	9.4	55
1,500	30	849	12.0	63	30	848	9.6	51	29	855	12.4	37	29	847	14.1	37	30	845	1.2	64	30	851	10.4	54	28	849	6.3	58
2,000	30	799	9.6	60	30	798	7.4	45	29	805	10.0	34	29	798	9.9	40	30	794	−.8	62	30	801	8.0	53	28	798	4.0	56
2,500	30	752	7.0	57	30	752	5.0	42	29	757	7.1	36	29	751	5.9	42	30	745	−3.3	61	30	754	5.6	51	28	750	2.1	54
3,000	30	708	4.1	53	30	706	2.0	44	29	712	4.4	32	29	706	2.2	43	30	699	−6.0	59	30	709	3.0	50	28	705	−.2	50
4,000	29	626	−2.2	52	30	623	−4.0	45	28	629	−1.8	33	28	623	−3.9	41	30	615	−11.5	53	30	626	−2.8	47	28	622	−5.8	46
5,000	27	551	−8.5	52	29	548	−10.5	43	28	554	−8.5	32	28	548	−10.1	38	30	539	−17.3	50	30	551	−9.3	42	27	546	−12.3	43
6,000	27	484	−15.4	47	29	481	−17.5	38	26	486	−15.5	29	28	481	−17.5	38	28	470	−24.1	48	30	483	−16.2	40	27	479	−19.1	40
7,000	27	423	−22.3	45	29	420	−24.8	36	25	425	−22.6	29	28	420	−24.5	36	27	410	−31.3	49	30	422	−23.4	38	27	418	−26.2	36
8,000	26	367	−29.9	44	28	365	−32.5	35	18	370	−30.2	30	28	365	−31.8	35	27	355	−38.0	49	28	368	−30.9	38	27	362	−34.0	38
9,000	26	318	−37.6	44	27	316	−40.1	----	17	320	−37.5	----	28	316	−39.4	35	27	306	−44.4	----	28	319	−38.3	38	25	313	−41.5	----
10,000	26	275	−45.2	----	25	272	−47.6	----	14	276	−44.6	----	28	273	−45.9	----	27	263	−50.5	----	28	275	−45.9	----	24	270	−48.6	----
11,000	24	236	−52.2	----	25	234	−54.6	----	13	237	−51.5	----	28	234	−52.2	----	24	226	−55.3	----	27	236	−53.5	----	24	231	−55.4	----
12,000	23	202	−58.1	----	25	200	−60.2	----	12	203	−58.3	----	27	201	−56.3	----	24	193	−57.8	----	25	202	−59.9	----	23	197	−61.1	----
13,000	22	172	−60.6	----	25	170	−62.4	----	6	172	−62.0	----	25	171	−58.8	----	21	164	−57.0	----	25	172	−63.3	----	23	167	−62.7	----
14,000	20	146	−60.9	----	22	145	−59.6	----	----	----	----	----	25	146	−59.9	----	20	140	−55.5	----	23	146	−61.7	----	22	142	−60.6	----
15,000	19	124	−60.9	----	18	123	−59.0	----	----	----	----	----	25	124	−60.9	----	16	119	−55.8	----	22	124	−60.8	----	19	121	−59.6	----
16,000	19	106	−61.6	----	14	105	−59.5	----	----	----	----	----	22	106	−62.3	----	13	101	−56.0	----	20	106	−61.0	----	16	103	−59.3	----
17,000	15	90	−62.5	----	9	90	−59.6	----	----	----	----	----	21	90	−62.6	----	7	86	−56.4	----	18	90	−61.1	----	11	87	−58.9	----
18,000	11	76	−61.9	----	----	----	----	----	----	----	----	----	18	76	−61.9	----	----	----	----	----	15	76	−61.2	----	7	74	−58.1	----
19,000	----	----	----	----	----	----	----	----	----	----	----	----	10	65	−61.0	----	----	----	----	----	8	65	−59.9	----	----	----	----	----
20,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	55	−58.8	----	----	----	----	----

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																							
	San Antonio, Tex. (175 m.)				San Diego, Calif. (1) (19 m.)				S. S. Marie, Mich. (221 m.)				Seattle, Wash. (1) (27 m.)				Spokane, Wash. (598 m.)				Washington, D. C. (25 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	994	19.3	82	26	1,012	15.0	76	30	991	4.6	77	30	1,010	8.3	83	30	940	10.2	62	30	1,016	13.2	60
500	30	957	18.1	82	26	955	12.2	68	30	959	6.7	69	30	954	7.0	77	----	----	----	----	30	960	13.1	54
1,000	30	903	16.1	76	26	900	10.2	60	30	902	6.0	62	30	897	4.4	72	30	896	10.4	56	30	904	10.7	52
1,500	30	851	14.2	74	26	848	8.0	54	30	848	3.5	58	30	844	1.2	71	30	843	6.9	53	30	851	7.5	54
2,000	30	802	12.2	63	26	798	6.6	45	30	797	1.2	58	30	792	−1.7	70	30	793	3.0	54	30	801	4.6	56
2,500	30	755	10.2	55	25	750	4.8	36	30	748	−1.3	57	30	744	−4.7	67	30	745	−0.9	56	30	752	1.4	60
3,000	30	711	7.6	46	25	705	2.5	32	30	703	−3.7	54	30	698	−7.6	63	30	700	−4.5	57	30	707	−1.3	59
4,000	30	629	1.3	40	25	622	−3.4	26	29	618	−9.1	49	29	613	−13.8	59	30	615	−10.8	57	30	623	−7.2	56
5,000	30	555	−5.6	39	25	548	−9.8	30	28	543	−15.6	46	29	537	−19.9	63	30	540	−17.3	55	28	548	−12.9	48
6,000	29	488	−12.7	39	23	480	−16.9	34	25	475	−22.5	44	29	468	−26.4	66	29	472	−24.5	54	27	479	−19.8	45
7,000	29	427	−19.6	39	22	420	−23.9	36	22	413	−29.5	43	29	407	−33.2	69	27	410	−31.3	55	27	418	−27.0	43
8,000	29	372	−26.8	38	9	364	−32.0	----	19	358	−36.6	43	26	352	−40.6	----	27	355	−38.5	55	25	362	−34.4	41
9,000	29	323	−33.5	37	9	315	−39.8	----	18	309	−43.5	----	24	303	−47.4	----	27	306	−45.3	----	23	314	−41.9	----
10,000	29	280	−40.8	----	9	272	−46.3	----	16	266	−50.0	----	22	260	−53.0	----	26	263	−51.5	----	23	270	−49.0	----
11,000	29	241	−48.2	----	6	233	−52.3	----	15	228	−55.5	----	22	223	−56.5	----	26	225	−56.1	----	22	231	−55.7	----
12,000	29	206	−55.0	----	5	198	−55.8	----	13	194	−59.2	----	21	190	−57.7	----	25	193	−58.6	----	22	197	−60.6	----
13,000	28	176	−59.9	----	----	----	----	----	12	165	−61.4	----	19	162	−57.3	----	21	164	−58.1	----	20	168	−63.6	----
14,000	28	150	−62.9	----	----	----	----	----	11	140	−60.6	----	12	138	−56.4	----	20	140	−55.8	----	20	142	−62.5	----
15,000	27	127	−64.5	----	----	----	----	----	10	118	−59.2	----	9	118	−56.4	----	18	120	−55.0	----	16	120	−62.6	----
16,000	25	108	−66.2	----	----	----	----	----	9	100	−58.9	----	7	100	−57.2	----	18	102	−54.8	----	10	103	−63.3	----
17,000	20	92	−68.0	----	----	----	----	----	6	84	−58.3	----	6	85	−56.7	----	16	87	−55.1	----	8	87	−62.9	----
18,000	18	76	−68.4	----	----	----	----	----	----	----	----	----	----	----	----	----	10	74	−54.9	----	7	74	−61.8	----
19,000	12	66	−66.0	----	----	----	----	----	----	----	----	----	----	----	----	----	6	64	−54.5	----	5	63	−60.4	----
20,000	9	56	−63.2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during April 1942*—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																							
	Anchorage, Alaska (42 m.)				Barrow, Alaska (6 m.)				Bethel, Alaska (7 m.)				Fairbanks, Alaska (156 m.)				Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	998	6.3	61	30	1,014	−15.0	93	30	1,000	3.5	69	30	986	6.0	46	30	1,001	7.0	63	29	1,005	7.9	69
500	30	944	3.2	61	30	951	−12.1	90	30	940	−0.1	70	30	945	3.1	48	30	947	3.9	66	29	949	4.9	75
1,000	30	887	−0.5	63	30	891	−10.2	81	30	883	−3.8	72	30	888	−1.2	51	30	891	0.0	71	29	893	1.0	79
1,500	30	833	−4.3	66	30	835	−11.1	75	30	829	−7.0	74	30	834	−5.0	55	29	836	−3.4	76	28	838	−2.9	83
2,000	30	781	−8.0	70	30	782	−12.9	69	30	777	−10.3	73	30	782	−8.6	58	29	785	−6.7	78	28	787	−6.0	82
2,500	30	732	−11.4	72	29	732	−15.4	66	30	728	−13.3	71	30	733	−12.1	60	29	736	−9.9	79	28	738	−9.0	80
3,000	30	686	−14.8	73	29	685	−18.2	64	30	681	−16.4	69	30	686	−15.5	61	27	689	−13.2	77	27	691	−11.7	78
4,000	30	600	−21.5	72	29	598	−24.1	60	29	595	−22.4	66	30	600	−22.0	63	27	603	−19.7	73	27	606	−18.3	75
5,000	30	523	−27.9	70	29	521	−30.0	59	29	519	−28.8	62	30	523	−28.0	63	23	526	−26.5	70	26	529	−24.8	73
6,000	30	455	−34.3	68	29	452	−36.7	59	29	450	−35.7	58	30	455	−34.7	61	18	458	−33.1	67	26	460	−31.2	71
7,000	30	393	−41.5	----	28	390	−43.6	----	28	388	−42.2	----	29	393	−41.8	----	16	395	−40.2	----	23	398	−37.7	69
8,000	29	338	−48.2	----	28	335	−50.0	----	28	334	−48.4	----	28	338	−48.4	----	16	341	−46.2	----	23	344	−43.7	----
9,000	29	290	−52.9	----	28	287	−53.4	----	28	287	−51.3	----	28	290	−53.7	----	16	292	−51.1	----	23	296	−49.2	----
10,000	29	248	−53.1	----	28	246	−52.7	----	27	246	−50.9	----	27	248	−54.9	----	16	250	−54.8	----	23	254	−52.8	----
11,000	29	213	−51.5	----	26	211	−50.3	----	25	211	−49.7	----	25	213	−51.9	----	15	214	−54.5	----	22	217	−54.2	----
12,000	28	183	−49.7	----	26	181	−48.8	----	24	181	−48.7	----	25	182	−50.1	----	15	183	−53.5	----	19	186	−54.3	----
13,000	27	157	−49.5	----	26	155	−48.7	----	21	155	−48.5	----	25	156	−49.6	----	13	156	−53.1	----	16	159	−53.4	----
14,000	26	135	−49.7	----	23	134	−48.7	----	21	133	−48.8	----	24	134	−49.5	----	12	134	−52.8	----	15	136	−52.9	----
15,000	22	106	−50.6	----	17	114	−49.3	----	18	114	−49.3	----	24	115	−50.0	----	8	114	−52.6	----	13	116	−53.2	----
16,000	19	99	−51.0	----	10	98	−49.7	----	16	98	−50.0	----	22	99	−50.6	----	6	97	−52.7	----	8	99	−53.4	----
17,000	16	85	−51.4	----	5	85	−50.0	----	10	84	−50.6	----	21	85	−51.0	----	5	84	−52.6	----	----	----	----	----
18,000	9	73	−51.8	----	----	----	----	----	6	71	−51.0	----	14	72	−51.3	----	----	----	----	----	----	----	----	----
19,000	----	----	----	----	----	----	----	----	----	----	----	----	9	62	−51.7	----	----	----	----	----	----	----	----	----

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level											
	McGrath, Alaska (103 m.)				Nome, Alaksa (14 m.)				San Juan, P. R. (15 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	17	989	5.2	51	30	1,000	−1.2	79	30	1,013	24.4	81
500	17	942	2.3	53	30	941	−3.1	79	30	959	22.0	85
1,000	17	885	−1.9	55	30	883	−5.1	78	30	905	18.7	86
1,500	17	830	−5.9	58	30	828	−7.9	78	30	855	15.8	85
2,000	17	778	−9.5	60	30	776	−10.8	77	30	806	13.1	82
2,500	17	729	−13.1	61	30	727	−13.8	75	30	759	11.5	75
3,000	17	682	−16.7	63	30	680	−17.0	74	30	715	9.5	67
4,000	17	596	−23.2	66	30	594	−23.3	71	29	633	4.9	52
5,000	17	519	−29.4	65	29	518	−29.4	69	28	560	−0.1	42
6,000	17	451	−35.8	64	29	450	−36.1	67	27	494	−6.1	35
7,000	17	390	−42.6	----	26	388	−42.9	----	25	434	−12.0	31
8,000	17	335	−49.4	----	26	334	−48.9	----	23	380	−18.9	30
9,000	16	287	−53.7	----	26	286	−52.6	----	22	331	−26.0	30
10,000	16	246	−53.7	----	24	245	−51.8	----	22	288	−33.5	29
11,000	15	211	−50.7	----	23	210	−49.5	----	20	250	−40.9	----
12,000	15	181	−49.4	----	21	180	−48.2	----	19	216	−48.4	----
13,000	15	155	−48.9	----	20	155	−48.0	----	19	184	−56.0	----
14,000	15	133	−49.2	----	18	133	−47.9	----	17	157	−63.8	----
15,000	15	114	−49.9	----	15	114	−48.7	----	17	133	−70.3	----
16,000	13	98	−50.6	----	14	98	−49.3	----	17	112	−76.3	----
17,000	11	84	−51.2	----	13	84	−49.7	----	14	94	−79.9	----
18,000	9	72	−51.4	----	9	72	−50.0	----	11	79	−81.0	----
19,000	----	----	----	----	7	62	−50.2	----	9	66	−77.7	----

NOTE.—All observations taken at 11 p. m., 75th meridian time, except at Norfolk, Va., where, between April 1 and 14, inclusive, observations were made near 4 a. m., 75th meridian time, and from the 15th through the 30th, at 11 p. m. and at Seattle, Wash., where they were taken about 5 a. m., 75th meridian time.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only, as temperature and humidity data are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below −40° C.

Stations marked with the figure one (1) are Navy stations.

LATE REPORT FOR JANUARY, FEBRUARY, AND MARCH

Altitude (meters) M. S. L.	Stations with elevations in meters above sea level															
	JANUARY 1942				FEBRUARY 1942				MARCH 1942							
	Pearl Harbor, T. H. (1) (7 m.)				Swan Island, W. I. (10 m.)				Brownsville, Tex. (6 m.)				Swan Island, W. I. (10 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	1,014	22.4	74	28	1,012	24.5	81	31	1,014	16.9	79	31	1,012	25.6	79
500	31	958	18.3	71	28	957	21.8	83	31	957	15.5	73	31	958	22.4	84
1,000	31	904	15.0	69	28	904	18.8	79	31	902	14.2	57	31	904	19.3	78
1,500	31	852	13.8	50	28	852	16.4	73	31	850	13.4	44	31	853	17.1	68
2,000	31	803	12.3	33	28	803	14.4	60	31	800	11.8	42	31	804	15.1	57
2,500	31	756	10.4	19	28	757	12.4	51	31	754	9.4	44	31	758	12.9	50
3,000	31	712	8.2	18	28	713	10.4	46	31	710	7.2	42	31	714	10.5	44
4,000	31	630	2.8	18	28	632	5.6	37	30	628	1.3	36	29	632	6.2	36
5,000	31	556	−2.9	22	28	559	0.2	28	30	553	−5.6	37	29	559	1.0	31
6,000	31	489	−9.5		28	493	−5.9	24	30	487	−12.5	38	29	493	−5.3	28
7,000	29	429	−16.7		27	433	−12.7	22	30	426	−19.4	38	29	434	−12.0	27
8,000					26	379	−19.8	21	30	372	−26.1	37	29	380	−19.4	26
9,000					26	330	−27.5	20	29	323	−33.3	37	27	331	−26.6	25
10,000					25	287	−35.5	20	29	280	−40.6		26	288	−33.8	25
11,000					25	248	−42.8		27	241	−47.5		26	249	−41.4	
12,000					25	214	−49.4		26	207	−53.4		26	214	−49.0	
13,000					25	183	−56.7		25	177	−58.8		26	184	−57.2	
14,000					23	156	−64.8		25	150	−63.5		26	156	−66.2	
15,000					22	132	−73.8		25	127	−68.4		25	132	−75.8	
16,000					22	111	−82.4		21	108	−72.3		24	111	−84.2	
17,000					21	92	−88.2		19	91	−74.8		22	92	−90.4	
18,000					16	76	−92.8		15	76	−76.4		14	76	−91.5	
19,000					11	63	−91.4		6	64	−77.0		8	63	−88.2	

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during April 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (866 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	29	187	4.5	30	209	3.1	30	252	1.7	30	312	2.0	29	207	1.0	30	341	1.0	29	128	6.1	28	260	4.3	27	316	1.8	30	183	2.2				29	267	1.5	26	155	2.1
500							30	242	2.3										28	136	7.4	28	262	6.0	27	308	3.1	30	206	2.6				29	238	3.1			
1,000	29	188	6.1				30	256	2.3				28	200	2.4	30	345	0.7	18	156	4.5	28	270	6.7	26	310	4.0	30	246	2.7				28	241	4.3			
1,500	26	207	6.7				30	266	2.5	30	294	2.0	28	216	3.4	30	248	1.0	17	186	4.4	25	268	6.5	22	294	6.3	29	275	3.4				26	240	4.3			
2,000	24	216	7.1	30	211	4.0	30	294	3.9	29	283	1.8	24	233	5.2	30	218	2.1	14	209	5.0	19	270	8.0	19	313	8.2	29	280	4.5				23	255	5.3	26	161	1.8
2,500	20	222	8.0	30	219	3.6	27	301	4.4	27	268	3.3	21	244	6.6	28	237	3.2	12	230	4.8	15	298	7.3	12	306	9.4	28	288	6.6				19	281	4.3	24	174	1.7
3,000	20	238	7.9	30	231	4.0	26	298	5.0	26	257	4.1	19	263	7.8	27	243	3.8	11	244	5.8	14	296	9.3	10	323	7.9	27	307	6.7				18	280	5.3	23	212	2.7
4,000	19	260	9.5	25	246	8.6	25	300	6.4	19	254	8.2	16	275	11.7	25	246	5.7	11	250	10.6	12	306	8.9				24	284	8.7				14	309	5.2	19	244	7.4
5,000	18	257	11.2	22	247	13.2	22	303	8.7	16	243	11.7	15	278	11.8	19	251	7.0	10	257	15.0	11	308	10.2				22	286	10.6							18	247	12.2
6,000	16	264	11.5	19	254	15.4	20	299	8.4	10	246	9.2	15	276	13.7	17	258	8.2				10	322	10.3				20	285	13.7							17	247	13.6
8,000	14	255	15.4	17	254	16.1	14	306	13.1				12	264	17.1	10	262	7.3										10	309	10.2							12	248	15.4
10,000	11	271	18.4	14	270	20.2	12	300	19.8																												10	256	18.4
12,000	11	269	29.1																																				
14,000																																							

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (265 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	235	3.2	30	234	1.4	30	300	1.5	29	248	1.4	30	283	1.7	30	83	3.8	30	218	2.8	28	159	3.2	28	346	1.2	30	77	4.1	30	183	2.5	29	158	2.9	30	226	0.9
500										29	239	2.4				30	95	2.0				28	162	4.9	28	335	0.9	30	84	4.7	30	190	3.5	29	162	2.9	30	222	1.8
1,000										29	258	3.2	30	279	2.4	29	331	0.3	30	217	3.6	26	179	6.1	28	209	0.9	29	78	3.9	29	196	4.6	26	171	2.2	29	224	2.4
1,500	30	227	3.8							29	274	3.4	30	283	3.1	29	279	1.8	30	220	3.5	25	193	5.8	28	198	2.8	27	35	2.5	28	209	5.4	25	193	2.2	28	222	3.4
2,000	30	223	4.1	30	217	2.3	30	249	1.4	29	289	4.3	29	269	4.2	29	293	3.2	30	209	4.7	25	208	6.8	25	209	4.0	25	17	1.9	27	240	5.9	23	182	1.5	26	237	3.1
2,500	30	232	4.8	30	211	2.9	29	234	1.9	29	290	5.3	25	263	5.7	27	285	3.4	30	227	4.7	21	205	4.7	24	217	5.1	24	348	2.6	26	264	7.7	23	214	1.7	25	246	4.4
3,000	30	247	6.3	26	202	3.2	29	239	3.3	28	297	7.2	24	256	6.3	26	288	4.2	29	234	4.1	18	241	3.1	22	222	5.5	22	319	3.0	24	260	9.4	22	237	2.1	20	266	4.0
4,000	21	251	9.8	18	197	2.7	22	218	7.0	24	298	10.6	17	261	10.0	21	292	7.3	22	243	2.8	10	292	3.6	17	225	8.0	17	293	4.3	21	265	10.4	20	279	4.8	15	271	4.3
5,000	19	254	11.0	15	246	4.4	15	239	8.7	21	296	13.4	12	262	12.0	18	295	8.7	19	263	7.7				16	226	10.6	16	283	7.2	19	279	10.1	14	289	8.1	11	298	3.8
6,000	16	266	13.9	11	288	8.6				21	297	15.8	10	263	12.7	16	297	11.4	17	277	7.5							13	292	10.8	16	293	12.2	11	289	11.0			
8,000	13	263	20.8	10	290	13.0				17	297	17.9							14	287	14.3										12	309	14.5						
10,000	11	264	23.8							14	297	18.3							10	282	17.3																		
12,000																																							
14,000																																							

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during April 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	28	241	2.1	28	250	4.2	24	178	8.4	30	170	3.2	30	246	1.5	26	210	1.3	28	164	3.7
500	28	273	4.6	28	242	3.2	24	182	9.9	30	169	3.8	30	247	2.4				28	168	4.1
1,000	26	292	6.0	23	247	2.3	23	183	9.2	30	174	4.3	30	242	3.0	26	213	1.3	27	190	5.1
1,500	25	305	8.6	21	223	2.2	22	193	8.8	27	188	5.0	30	233	3.8	26	216	2.0	27	221	6.2
2,000	17	322	9.5	17	292	2.9	20	207	10.3	25	208	4.6	30	227	4.8	24	234	4.1	26	236	6.1
2,500	15	326	10.8	15	306	4.0	16	229	9.8	22	238	5.1	30	234	5.6	19	237	6.2	25	250	7.5
3,000	13	336	12.0	13	337	7.6	15	226	8.3	21	247	5.9	30	245	6.6	17	243	7.1	24	266	7.8
4,000				13	309	9.2	13	250	9.8	16	256	5.0	29	250	8.9	16	259	8.1	21	271	7.3
5,000				11	326	12.4	11	265	11.7	14	254	5.4	23	262	11.2	14	243	11.2	16	293	7.1
6,000				10	317	16.3	11	265	13.4	13	267	5.2	21	265	12.8	12	253	10.8	14	300	8.8
8,000							10	267	15.2	10	297	9.6	20	274	16.4	11	248	16.8	12	306	9.3
10,000													14	274	19.3						
12,000																					
14,000																					

Altitude (meters) m. s. l.	San Antonio, Tex. (180 m.)			San Diego, Calif. (15 m.)			Sault St. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	29	133	3.6	23	264	3.9	29	278	2.5	30	257	2.4	27	215	2.0	29	303	1.6
500	29	130	5.0	23	274	4.0	29	270	3.6	30	209	2.5				29	286	3.3
1,000	28	145	5.0	20	258	2.4	29	273	4.3	29	192	3.9	27	223	4.6	27	282	4.9
1,500	26	165	4.5	18	284	1.5	29	307	3.5	28	189	5.6	27	221	3.5	27	294	6.0
2,000	22	200	3.3	14	254	2.2	29	306	4.6	24	191	7.1	26	226	5.1	23	299	7.2
2,500	15	251	3.2	14	266	3.2	25	302	6.6	21	205	6.4	26	223	5.6	19	301	7.3
3,000	13	253	4.9	13	303	6.1	21	312	7.8	19	216	8.2	23	228	6.2	18	311	8.7
4,000	12	268	9.8				17	301	10.3	13	214	8.8	18	239	7.4	14	320	10.4
5,000							10	295	12.3				13	246	7.4	12	312	12.2
6,000													11	251	8.3	11	321	14.1
8,000																		
10,000																		
12,000																		
14,000																		

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during April 1942*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. o.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	35.6	WSW	1,000	2	Boston, Mass.	42.4	W	3,350	6	Caribou, Maine	61.6	NNW	6,730	8	Portland, Maine.
East-Central [2]	36.5	SW	2,500	9	Knoxville, Tenn.	53.0	WNW	4,400	11	Greensboro, N. C.	61.2	WNW	6,030	11	Greensboro, N. C.
Southeast [3]	30.7	S	1,370	7	Birmingham, Ala.	34.8	NW	3,740	11	Atlanta, Ga.	61.0	W	12,780	11	Miami, Fla.
North-Central [4]	45.1	W	1,610	28	Duluth, Minn.	51.4	W	3,950	28	Duluth, Minn.	74.0	WSW	10,210	9	Marquette, Mich.
Central [5]	42.4	SSW	1,650	27	Des Moines, Iowa	52.5	WNW	4,600	10	Moline, Ill.	54.0	WNW	12,070	11	St. Louis, Mo.
South-Central [6]	45.3	WSW	2,310	30	Big Spring, Tex.	44.8	WSW	3,930	24	Big Spring, Tex.	60.0	W	12,870	11	Abilene, Tex.
Northwest [7]	28.1	WSW	2,440	14	Billings, Mont.	39.3	N	5,000	23	Medford, Oreg.	58.5	NNW	7,350	23	Spokane, Wash.
West-Central [8]	43.8	SW	2,500	27	Reno, Nev.	50.6	NW	5,000	22	Redding, Calif.	70.0	NW	8,130 / 8,950	22	Redding, Calif.
Southwest [9]	40.0	SW	2,280	18	Roswell, N. Mex.	56.4	SSE	3,810	20	Sanberg, Calif.	60.2	W	10,240	30	Albuquerque, N. Mex.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, Southern Ohio, Kentucky, Eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri. (Chicago, Ill., not received).
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and Western Tennessee.
[7] Montana, Idaho, Washington and Oregon.
[8] Wyoming, Colorado, Utah, Northern Nevada and Northern California.
[9] Southern California, Southern Nevada, Arizona, New Mexico, and extreme West Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

There was a marked deficiency of precipitation during April in the Atlantic area from Georgia northward with the driest area centered in Virginia. In contrast there was an abundance of precipitation and accompanying damaging floods in a large area comprising the six States, Colorado, New Mexico, Kansas, Oklahoma, Arkansas, and Texas.

St. Lawrence drainage.—Light flooding occurred again during April in the Maumee River system. The stages had fallen to fairly low stages following the overflows in March but with moderately heavy rains from April 6 to 10, the stages rose to slightly above flood stage. The Sandusky River also overflowed, reaching a stage of 13.6 feet at Upper Sandusky, Ohio, on April 11.

Atlantic Slope drainage.—River stages were moderately high in New England, stages slightly above flood stage being recorded in the Connecticut River; in South Carolina and Georgia, the stages were generally above flood from March. Otherwise, stages were generally low.

A snow survey made on April 3–6 at 23 stations in the Merrimack Basin above Franklin, N. H., showed an average snow depth of 16.8 inches, with an average water content of 5.79 inches compared with a value of 4.45 inches of water obtained from a survey of February 10–16. A survey of 8 selected stations in the Pemigewasset River Basin on April 14 gave an average water content of 6.06 inches, or a decrease of 1.08 inches for that basin since the April 3–6 survey.

The entire Merrimack Basin, except the upper reaches of the Contoocook River, was clear of snow cover before April 1. All river ice had disappeared from the reaches below Franklin by March 18, which is unusually early.

A moderate rise occurred in the main river on April 8–10 but did not reach bankfull. It was produced by rainfall on the 7th, averaging one-half inch over the basin. The estimated run-off from snow was 1 inch. Lesser peak stages occurred later, with flows continuing moderately high into the first week of May.

Moderate rains on the 7th and 8th and run-off from melting snow in the Upper Connecticut River resulted in high water generally and a stage of 17.2 feet at Hartford, Conn., on April 10. Unseasonably high temperatures during the remainder of the month accelerated snow melt and caused a general rise in most upper river tributaries, cresting at South Newbury, Vt., on April 28 at a stage of

22.7 feet. The crest leveled out downstream without much discharge from the lower tributaries. No actual damage occurred from the high water during April; however, river transportation and construction along the river were delayed or inconvenienced; at Hartford, the stages remained above 7 feet the entire month.

Flood stages continued in the Ogeechee and Altamaha River Basins from the preceding month. In the former basin, flooding continued until April 5. In the latter basin, floods prevailed in the lower Ocmulgee, lower Oconee, and in the Altamaha River at the beginning of April as the result of the heavy rainfall of March 20–21. Crest stages had been reached in March on all gages except those in the lower Altamaha; the flood crested at Doctortown, Ga., on April 2–3 and at Everett City, Ga., on April 5.

The damage was not severe in any locality in the basins of the Oconee, Ocmulgee, and Altamaha Rivers, although a stage equal to the highest of record, 26 feet, occurred at Macon, Ga. (Ocmulgee River), on March 22, and a high stage of 32.6 feet at Milledgeville, Ga. (Oconee River), on the same date. The crest in the Altamaha River was flat due to the fact that the peak discharge from the crest in the Ocmulgee reached the Altamaha after the crest in the Oconee River.

East Gulf of Mexico drainage.—Overflows in this area were mainly a continuation of floods which began in March. Flood conditions developed in the Chattahoochee, Flint, and Apalachicola Rivers, from excessive rains that occurred between Eufaula, Ala., and Dahlonega, Ga., on March 20–21. Rainfall amounts ranged from 4 to 6 inches between West Point and Griffin, Ga., with 2 to 4 inches over the watershed north of Atlanta, Ga., and less than 1 inch south of Eufaula, Ala., and Montezuma, Ga. Crest movement was fairly rapid in the upper Chattahoochee, but became gradually slower downstream due to additional rains, light to moderate, that occurred between March 26 and 28. Damage was light, although somewhat greater in the River Junction—Blountstown, Fla., area on the Apalachicola River.

Upper Mississippi Basin.—Light flooding occurred during the month in the Salt and Meramec Rivers in Missouri and in the Illinois River. In the latter stream, flood stages prevailed from March through most of April.

Melting snows in the headwaters of the Mississippi in March crested stages in the upper reaches during the last few days of March and the first of April. The main river exceeded flood stage only at Hannibal and Louisiana, Mo., on April 10 to 11, where stages were slightly above flood stage.

Missouri Basin.—Damaging flash floods occurred during the night of April 18–19, in Medicine, Coon, and Red Willow Creeks, tributaries of the Republican River between Cambridge and McCook, Nebr. Considerable damage resulted in and around Indianola, Cambridge, and Bartley, Nebr.; the total loss in this area has been estimated at more than $120,000. The Republican River rose to bankful in Nebraska, with slight overflows in low places in the vicinity of Guide Rock, Nebr., on April 21.

Light floods occurred at a few points along the Solomon and Osage Rivers in Kansas, and moderate floods in the Upper South Platte and in the Smoky Hill River. The latter stream overflowed twice during the month at Lindsborg and Salina, Kans. The second rise was the higher, occurring 3 days after the first, and exceeded flood stage at Lindsborg by 5 feet on April 26, and by 2 feet at Salina on April 28. At the latter place, 40 city blocks were flooded and 150 basements filled by the floodwaters. Damage from the two rises totaled $22,600 of which the greater part was to growing crops.

Ohio Basin.—Heavy rains occurred over all of the Ohio Basin, except in the upper Tennessee and Cumberland River Basins, from the 7th to the 10th and caused a general rise in the Ohio from Pittsburgh to its mouth. Flood stages were exceeded, however, only at Dam No. 7, in the upper portion, and from Mount Vernon, Ind., to Cairo, Ill., in the lower portion. The stages were not high enough to cause any significant damage.

In the basin above Pittsburgh, Pa., the rainfall was heaviest over the lower Monongahela, Youghiogheny, and upper Kiskiminetas Basins, the maximum 24-hour amount being 3.13 inches at Johnstown, Pa. Flood stage was exceeded only at Lock No. 5 on the Allegheny River.

Light to moderate floods occurred in the Hocking, Olentangy, and Scioto Rivers in Ohio, but losses were small. In Kentucky, the Green River from Brownsville, Ky., to the mouth, and the Rough and Barren Rivers, tributaries of the Green, were in moderate flood. The total loss in the Green River Basin has been estimated at $17,000 of which the greater part was to growing crops. In the Wabash River Basin, a considerable rise occurred throughout the entire watershed and low to moderate flood stages were recorded at most of the stations. The total damage for the basin has been estimated at over $90,000.

Flood stages were not reached in the Cumberland or Tennessee Rivers although the rains were heavy over the lower portions. The rainfall of April 7–10 averaged 4.50 inches in the Lower Cumberland with 3 inches of this amount falling within 24 hours up to 7 a. m. of the 9th. In the same 24 hours, 4.90 inches occurred at Johnsonville, Tenn., in the Lower Tennessee Basin. The rainfall was considerably less in the upper portions of these basins. The total monthly precipitation at Asheville, N. C., in the Upper Tennessee Basin, 1.08 inches, was the lowest April amount in 40 years of record. Stream flow at Knoxville, Tenn., during the month was the lowest flow recorded during the past 42 years.

Lower Mississippi Basin.—Heavy rains over most of the basin from the 6th to the 9th resulted in moderate flooding in the St. Francis and Yazoo River Basins. In the Upper St. Francis Basin the rainfall averaged 4.16 inches, and in the Upper Yazoo Basin about 6 inches. Moderate overflows of low-lying farm land along the St. Francis River from Wappapello, Mo., to below St. Francis, Ark., occurred, and in the Yazoo Basin about 325,000 acres of land were inundated.

Arkansas-White-Red Basins and West Gulf of Mexico drainage.—Widespread floods, unusually severe in some cases, occurred in most of this drainage area. Outstanding among these floods were the unusually high stages in the Purgatoire River in Colorado and in the Arkansas River from the mouth of Purgatoire River through most of Kansas; and in the Trinity River, where the highest stages since 1908 were reached twice during the month at Dallas, Tex., and exceeded at Trinidad, Tex. A full report of these floods will be made in a later issue of the REVIEW.

ESTIMATED FLOOD LOSSES AND SAVINGS, APRIL 1942 [1]

River and drainage	Tangible property	Matured crops	Prospective crops	Livestock and other movable farm equipment	Suspension of business	Total losses	Total savings
ATLANTIC SLOPE							
Altamaha River [2]	$9,500	$400	$16,800	$10,500	$17,500	$54,700	$78,000
EAST GULF OF MEXICO							
Apalachicola River [2]	100		150	1,000	10,000	11,250	5,000
MISSOURI BASIN							
Smoky Hill River	1,600		19,000	1,000	1,000	22,600	10,000
Republican River [3]	120,850					120,850	
OHIO BASIN							
Green River	1,000		15,000		1,000	17,000	([4])
Wabash River	30,500		61,600		11,200	103,300	14,750
Ohio River			1,500		2,750	4,250	10,000
LOWER MISSISSIPPI BASIN							
Yazoo River			300,000		175,000	475,000	25,000
WEST GULF OF MEXICO							
Brazos River	10,000	750	78,500	2,500	26,000	117,750	5,625

[1] Complete data for floods in White-Arkansas-Red Basins and West Gulf of Mexico drainage not available.
[2] March and April.
[3] Including livestock.
[4] Figures not available but believed considerable because of timely moving of livestock and farm machinery.

FLOOD-STAGE REPORT, APRIL 1942

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—dates: From—	Above flood stages—dates: To—	Crest: Stage	Crest: Date
ST. LAWRENCE DRAINAGE					
Lake Erie					
	Feet			Feet	
St. Marys: Decatur, Ind	13	9	14	17.8	12
St. Joseph: Montpelier, Ohio	10	11	12	10.4	12
Maumee: Fort Wayne, Ind	15	10	11	15.1	15
Sandusky: Upper Sandusky, Ohio	13	11	11	13.6	11
ATLANTIC SLOPE DRAINAGE					
Connecticut:					
South Newbury, Vt	22	27	29	22.7	28
Hartford, Conn	16	9	11	17.2	10
Santee: Rimini,[1] S. C	12	([2])	1	15.1	Mar. 26
Ogeechee: Dover, Ga	7	([2])	5	9.9	Mar. 29
Ocmulgee:					
Abbeville, Ga	11	([2])	3	17.8	Mar. 27–28
Lumber City, Ga	15	([2])	4	19.6	Mar. 31
Oconee: Mount Vernon, Ga	16	([2])	3	20.9	Mar. 28
Altamaha:					
Charlotte, Ga	12	([2])	18	23.7	Mar. 31
				12.9	15
Doctortown, Ga	10	2	3	10.0	2–3
Everett City, Ga	10	([2])	13	13.9	5
EAST GULF OF MEXICO DRAINAGE					
Flint: Bainbridge, Ga	25	([2])	1	27.9	Mar. 31
Apalachicola: Blountstown, Fla	15	([2])	8	22.1	Mar. 27–28
Tombigee:					
Lock No. 3, Ala	33	([2])	3	53.6	Mar. 25
Lock No. 2, Ala	46	([2])	1	54.8	Mar. 27
Lock No. 1, Ala	31	([2])	4	37.0	Mar. 29–30
Pascagoula: Merrill, Miss	22	([2])	1	23.2	Mar. 29
Pearl: Pearl River, La	12	([2])	4	14.0	Mar. 28
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Salt: New London, Mo	19	11	11	19.25	11
Illinois:					
Havana, Ill	14	([2])	22	16.2	Mar. 24–25
				15.7	12
Beardstown, Ill	14	([2])	25	17.2	Mar. 24–26
				17.4	14
Meramec:					
Sullivan, Mo	11	10	10	11.2	10
Pacific, Mo	11	10	([3])	[4] 12.7	11
Valley Park, Mo	14	11	11	14.3	11

See footnotes at end of table.

FLOOD-STAGE REPORT, APRIL 1942—Continued

River and station	Flood stage	Above flood stages—dates: From—	Above flood stages—dates: To—	Crest: Stage	Crest: Date
MISSISSIPPI SYSTEM—continued					
Upper Mississippi Basin—Continued					
Maramec—Continued					
Mississippi:	Feet			Feet	
Hannibal, Mo	13	10	11	13.2	10
Louisiana, Mo	12	10	11	12.4	11
		18	20	[5] 12.2	18
Missouri Basin					
Solomon: Beloit, Kans	18	25	27	21.7	26
Smoky Hill:					
Lindsborg, Kans	21	22	23	22.9	22–23
		25	27	26.0	26
Salina, Kans	20	24	24	20.0	24
		27	28	22.5	28
Republican: Guide Rock, Nebr	9	20	21	10.1	21
Osage: LaCygne, Kans	25	10	11	25.2	10
Ohio Basin					
Allegheny: Lock No. 5, Schenley, Pa	24	10	10	24.5	10
Hocking: Athens, Ohio	17	11	11	17.8	11
Olentangy: Delaware, Ohio	9	10	10	10.1	10
Scioto:					
Larue, Ohio	11	9	11	13.1	10
Prospect, Ohio	10	10	13	12.0	11
Circleville, Ohio	14	10	12	16.7	11
Chillicothe, Ohio	16	12	12	16.8	12
Barren: Bowling Green, Ky	28	11	11	28.8	11
Rough: Dundee, Ky	25	10	14	28.2	11
Green:					
Lock No. 6, Brownsville, Ky	28	12	12	28.0	12
Lock No. 4, Woodbury, Ky	33	10	14	38.5	12
Lock No. 2, Rumsey, Ky	34	11	19	38.1	16
West Fork of White:					
Anderson, Ind	10	9	12	11.3	10
Elliston, Ind	18	9	15	25.0	12
Edwardsport, Ind	12	9	19	21.4	14
East Fork of White: Seymour, Ind	14	10	12	15.1	11
White:					
Petersburg, Ind	16	10	19	22.1	16
Hazleton, Ind	16	11	21	23.0	17
Wabash:					
Bluffton, Ind	10	11	13	10.8	12
Wabash, Ind	12	9	13	16.0	11
LaFayette, Ind	11	9	15	17.5	12
Covington, Ind	16	9	16	21.0	13
Terre Haute, Ind	14	9	18	16.9	14–15
Riverton, Ind				18.2	17–18
Vincennes, Ind	14	12	20	15.3	17–18
Mount Carmel, Ill	17	11	21	21.4	17–18
New Harmony, Ind	15	15	22	17.1	19
Ohio:					
Dam No. 7, Midland, Pa	30	11	11	32.0	11
Mount Vernon, Ind	35	17	19	35.2	18
Dam No. 49, Uniontown, Ky	37	19	19	37.1	19
Shawneetown, Ill	33	13	22	36.8	18
Dam No. 50, Fords Ferry, Ky	34	13	23	38.5	19
Dam No. 53, near Mound City, Ill	42	14	17	42.4	15–16
Cairo, Ill	40	12	20	42.4	15–16
White Basin					
Current: Doniphan, Mo	10	11	12	10.2	11
Black:					
Poplar Bluff, Mo	16	9	12	17.2	11
Black Rock, Ark	14	8	25	23.0	10
		29	30	14.6	29
Little Red: Heber Springs, Ark	30	9	9	32.3	9
White:					
Calico Rock, Ark	18	9	10	19.3	10
Batesville, Ark	23	9	13	25.4	10
Newport, Ark	26	12	17	27.9	15
Georgetown, Ark	21	11	([6])	24.8	17
				22.2	30
Des Arc, Ark	24	13	([6])	27.6	18–19
				24.6	30
Clarendon, Ark	26	13	([6])	29.3	21–22
St. Charles, Ark	25	16	([6])	27.6	24
				27.7	27–28
Arkansas Basin					
Cimarron: Perkins, Okla	11	9	10	12.7	10
		17	17	11.7	17
		18	21	14.4	20
		22	24	13.9	23
		24	28	13.2	26
Verdigris: Sageeyah, Okla	35	12	12	35.1	12
		21	23	36.3	22
Neosho:					
Parsons, Kans	22	10	10	22.2	10
Oswego, Kans	17	9	12	19.9	11
Fort Gibson, Okla	22	9	12	24.6	11
		21	22	26.1	22
		25	26	23.0	25
		27	29	27.4	28
North Canadian:					
Woodward, Okla	5	22	22	5.4	22
Canton, Okla	9	23	23	9.6	23
Yukon, Okla	8	([3])	([6])	13.2	10
				13.4	20
				14.3	25

See footnotes at end of table.

FLOOD-STAGE REPORT, APRIL 1942—Continued

River and station	Flood stage	Above flood stages—dates: From—	Above flood stages—dates: To—	Crest: Stage	Crest: Date
MISSISSIPPI SYSTEM—continued					
Arkansas Basin—Continued					
Canadian:					
Canadian, Tex	5	21	21	5.3	21
		26	26	6.0	26
Union City, Okla	7	27	28	7.6	28
Petit Jean: Danville, Ark	20	9	13	23.2	11
Arkansas:					
Dodge City, Kans	5	23	[6]	7.7	28
Arkansas City, Kans	16	27	29	16.65	27
Webbers Falls, Okla	23	9	13	27.1	11
		21	22	24.3	22
		25	[6]	27.7	26
				29.8	28
Fort Smith, Ark	22	9	15	28.7	12
		21	[6]	24.8	23
				31.2	27
Van Buren, Ark	22	9	15	27.8	12
		22	[6]	24.3	23
				30.0	27
				31.3	30
Ozark, Ark	22	11	14	24.0	12
		26	[6]	28.2	30
Dardanelle, Ark	22	11	15	25.2	13
		26	[6]	28.7	May 1
Morrilton, Ark	20	11	15	22.0	14
		26	[6]	25.4	May 2
Little Rock, Ark	23	28	[6]	24.8	May 2
Pine Bluff, Ark	25	13	15	26.0	14
		28	[6]	27.7	May 3
Red Basin					
Little Missouri: Boughton, Ark	20	9	11	22.6	10
Saline: Benton, Ark	20	9	9	24.7	9
		28	28	21.4	28
Ouachita:					
Arkadelphia, Ark	17	8	12	26.8	9
		28	[6]	23.6	29
Camden, Ark	26	9	20	40.2	12
		27	[6]	34.2	May 3
Little: Whitecliffs, Ark	25	9	17	28.0	11
Sulphur:					
Hagansport, Tex	38	8	13	43.6	9
		21	28	41.3	22
				39.3	26
Naples, Tex	22	9	20	32.5	12
		24	[6]	28.4	25
Cypress: Jefferson, Tex	18	11	17	23.8	13
Red:					
Arthur City, Tex	27	10	11	28.3	10
		25	29	31.8	26
Index, Ark	25	10	16	28.6	14
		22	24	25.5	23
		26	[6]	30.4	May 1
Fulton, Ark	25	10	20	32.7	15
		21	[6]	33.3	May 2
Grand Ecore, La	33	16	[6]	36.2	21
				[7]	-----
Alexandria, La	32	14	[6]	[7]	-----

River and station	Flood stage	Above flood stages—dates: From—	Above flood stages—dates: To—	Crest: Stage	Crest: Date
MISSISSIPPI SYSTEM—continued					
Lower Mississippi Basin					
Bit Lake Outlet: Manila, Ark	10	10	[6]	14.3	16–17
St. Francis:					
Fisk, Mo	20	10	17	22.6	13
St. Francis, Ark	18	10	23	20.1	14–15
Tallahatchie: Swan Lake, Miss	26	11	[6]	29.3	16
Coldwater: Coldwater, Miss	13	9	16	19.2	10
		29	30	13.5	29
WEST GULF OF MEXICO DRAINAGE					
Sabine: Logansport, La	25	20	[6]	32.0	24
West Fork of Trinity: Fort Worth, Tex	17	20	20	17.6	20
		24	25	19.0	24
Elm Fork of Trinity: Carrollton, Tex	6	8	12	12.1	8
		13	16	7.2	15
		20	30	14.4	20
				14.5	25–26
East Fork of Trinity: Rockwall, Tex	10	7	17	20.4	9
		19	30	[8] 24.8	20
				14.8	25
Trinity:					
Dallas, Tex	28	8	18	37.7	10
		19	[6]	45.4	21
				45.8	26
Rosser, Tex	26	8	[6]	36.7	13
				[8] 41.5	22
Trinidad, Tex	28	8	[6]	[8] 40.8	25
Long Lake, Tex	40	12	[6]	44.5	13–14
				44.0	19
				51.6	29
Liberty, Tex	24	10	[6]	26.4	15
				26.8	29–30
Brazos:					
Rainbow, Tex	20	25	26	21.7	26
Waco, Tex	27	24	27	36.2	25
Guadalupe: Victoria, Tex	21	9	12	22.4	11
Rio Grande:					
Lobatos Bridge, Colo	4	[2]	20	[4] 4.6	25
Embudo, N. Mex	8	18	18	8.1	18
		23	[6]	9.0	24
Espanola, N. Mex	7	[2]	[6]	[4] 9.65	24
Albuquerque, N. Mex	4	18	19	4.1	18
		23	25	4.7	24
GULF OF CALIFORNIA DRAINAGE					
Colorado Basin					
Gunnison: Delta, Colo	9	14	17	9.6	15
		23	23	9.0	23

[1] Affected by backwater from dam.
[2] Continued from preceding month.
[3] Unknown.
[4] From incomplete data available.
[5] Due to manipulation of Dam No. 24.
[6] Continued into following month.
[7] Crest not yet reached at end of month.
[8] Levees broke, checking true crest.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW, January 1941, pp. 30-31]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	64.6	+1.1	Talladega	97	30	Fayette	25	1	1.80	−2.70	Robertsdale	4.68	Guntersville Dam	0.46
Arizona	56.5	−1.9	Casa Grande Ruins	100	[1] 1	Fort Valley	10	30	1.16	+.49	Junipine	2.90	2 stations	T
Arkansas	62.8	+1.3	3 stations	88	[1] 4	Gilbert	20	1	8.42	+3.45	Sheridan	13.44	Subiaco	4.36
California	54.0	−2.1	2 stations	96	[1] 1	Ellery Lake	−8	29	3.98	+2.26	Butte Meadows	16.67	2 stations	.00
Colorado	46.4	+2.6	do	88	[1] 14	Taylor Park	−12	1	4.35	+2.55	San Isabel	11.74	Norwood	.42
Florida	68.9	−.9	Blountstown	97	30	2 stations	30	[1] 2	2.63	−.28	Miami Airport	20.40	2 stations	.01
Georgia	61.1	+.7	Camilla	96	30	Blairsville	20	2	1.38	−2.37	Dublin	3.05	Waycross	.11
Idaho	46.6	+1.4	3 stations	89	[1] 20	Blackfoot Dam	−3	2	1.52	+.09	Deception Creek	4.95	Bliss	.39
Illinois	56.2	+3.7	Cicero	93	30	2 stations	24	[1] 11	2.62	−.89	Brookport	5.63	McHenry Dam	.49
Indiana	56.2	+4.3	2 stations	95	30	Forest Reserve	22	13	2.92	−.63	Newburg	4.29	Albion	1.23
Iowa	54.8	+6.0	Clinton	90	29	3 stations	19	[1] 8	1.06	−1.64	Dubuque	2.96	Sioux Rapids	T
Kansas	58.1	+3.3	5 stations	94	4	Oberlin	17	9	4.47	+1.90	Coffeyville	9.39	Morrill	.30
Kentucky	58.1	+2.0	Quicksand	95	30	Lynch (near)	18	[1] 11	3.01	−.97	Hartford	6.82	Jenkins	.42
Louisiana	67.0	±.0	3 stations	90	26	4 stations	30	1	5.10	+.40	Lake Arthur (near)	11.55	Covington	.70
Maryland-Delaware	55.7	+3.4	Cumberland, Md	96	30	Oakland, Md	18	14	1.10	−2.41	Oakland, Md	3.38	Leonardtown, Md	.45
Michigan	49.1	+6.2	2 stations	91	30	Watersmeet	6	8	1.26	−1.10	Three Rivers	3.17	Lowell	.22
Minnesota	49.1	+6.0	Winnibigoshish	87	24	Itasca State Park	7	8	2.06	−.06	Fergus Falls	4.65	Baudette	.53
Mississippi	65.5	+.9	2 stations	92	29	2 stations	28	1	3.52	−1.36	Batesville	10.21	Louisville	.67
Missouri	59.1	+3.8	Canton	94	29	do	20	1	3.83	−.12	Neosho	8.55	Oregon	.64
Montana	46.0	+2.8	2 stations	90	22	Summit	−1	7	1.04	−.09	Hammond	2.80	Valier	T
Nebraska	53.7	+4.4	Alma	91	4	Ewing	15	1	2.99	+.60	Arthur	7.34	Pawnee City	T
Nevada	48.8	+.8	Overton	93	[1] 8	Marlette Lake	4	29	.91	+.11	Marlette Lake	3.73	3 stations	.00
New England	46.3	+2.6	2 stations	89	30	Greenville, Maine	9	9	1.94	−1.39	Pinkham Notch, N. H	6.06	Springfield, Mass	.43
New Jersey	53.1	+3.5	Belvidere	95	30	Layton	18	14	1.39	−2.26	2 stations	2.34	Hammonton	.58
New Mexico	51.6	+.1	Carlsbad	92	28	2 stations	10	[1] 1	2.97	+2.05	Pasamonte (near)	7.90	Bluewater	.04
New York	48.9	+4.6	Port Jervis	92	30	Millerton	18	14	2.32	−.65	Chasm Falls	4.91	Mohonk Lake	.85
North Carolina	60.3	+2.3	Mount Gilead	94	[1] 5	Mount Mitchell	10	[1] 1	1.10	−2.46	Red Springs	3.00	Newbern	.30
North Dakota	44.9	+3.4	2 stations	90	[1] 14	McHenry	−6	8	1.96	+.51	Fargo	4.24	Park River	.50
Ohio	54.5	+4.6	Ironton	96	30	Millport	21	13	2.70	−.47	Norwalk	4.12	Germantown	1.55
Oklahoma	62.3	+1.9	Hollis	95	4	Nowata	24	1	8.31	+4.83	Madill	15.73	Laverne	3.49
Oregon	47.8	+.6	Echo	90	20	Unity	6	23	1.86	−.12	Tillamook	7.32	2 stations	.12
Pennsylvania	52.9	+4.2	4 stations	94	30	2 stations	14	12	2.21	−1.21	Indiana	4.93	Tanners Falls	1.08
South Carolina	64.2	+1.9	2 stations	95	[1] 28	Caesars Head	23	1	1.40	−1.84	Kershaw	3.11	Cherokee (near)	.45
South Dakota	50.8	+4.9	Ipswich	95	15	Lemmon	6	7	2.95	+.85	Martin	6.61	Vermillion	.24
Tennessee	60.8	+2.1	Coldwater	96	29	Erwin	20	1	2.60	−1.80	Moscow	7.86	Kingsport	.39
Texas	65.9	−.2	Laredo	104	30	2 stations	24	[1] 1	5.50	+2.47	Fort Worth	16.97	San Benito	.02
Utah	47.9	+.8	St. George	89	21	Silver Lake	4	23	1.60	+.39	2 stations	6.11	Myton	.16
Virginia	57.9	+3.3	Warsaw	94	[1] 6	Mountain Lake	19	1	.66	−2.64	Mount Weather	1.98	Moores Creek Dam	T
Washington	49.5	+1.5	Mottinger	91	20	Newport	19	27	1.90	−.26	Quinault	10.26	Quincy	.06
West Virginia	54.7	+2.9	Hinton	97	30	Bayard	13	15	1.86	−1.66	Rowlesburg	4.27	2 stations	.23
Wisconsin	50.0	+6.3	2 stations	90	30	Land O'Lakes	8	8	1.72	−.80	New London	3.93	Ashland	.54
Wyoming	44.3	+4.0	Rochelle	86	15	Foxpark	−7	[1] 1	2.32	+.69	Kirtley (near)	8.49	2 stations	.16
Alaska (March)	16.1	+2.5	View Cove	64	31	Allakaket	45	21	2.18	+.36	Little Port Walter	22.54	Wiseman	T
Hawaii	67.6	−1.6	Makaweli	88	3	Volcano Observatory.	41	8	23.60	+15.60	Puohakamoa No. 2	111.75	Waiopai Ranch	.00
Puerto Rico	76.0	+1.1	Dos Bocas	96	12	2 stations	54	[1] 8	7.66	+3.37	Rio Blanco	21.63	Central San Francisco.	1.55

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments			Pressure			Temperature of the air									Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation			Wind					Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range				Total	Departure from normal	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date							
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F		°F	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.	
New England							44.1	+2.6										72	1.56	-1.5										5.5			
Eastport	75	67	85	29.87	29.96	+0.03	41.0	+2.0	72	25	48	28	9	34	31	37	34	79	1.57	-1.3	12	10.3	n.	29	e.	10	10	11	9	5.3	9.9	0.0	0
Greenville, Maine	1,070	6		28.81	29.99		37.9	+1.4	79	25	50	9	13	26	49	35	30		2.96		14		nw.				11	4	15		20.8	.0	1
Portland, Maine [1]	103	5	36	29.86	29.97	+.01	44.6		82	30	55	26	14	35	42	39	33	70	2.17	-1.2	11	9.2	n.	25	nw.	8	14	7	9	4.8	6.3	.0	2
Concord [2]	289	54	2	29.66	29.98	-.01	46.6	+3.2	85	25	60	19	14	33	50	40	33	64	1.45	-1.3	10	7.6	nw.	29	w.	12	11	9	10	5.3	5.8	.0	0
Burlington [2]	403	11	48	29.55	29.99	.00	45.4	+2.1	79	25	54	28	9	36	36	41	36	74	3.08	+.9	12	9.0	n.	34	s.	5	7	9	14	6.5	5.0	.0	1
Northfield	876	12	60	29.05	30.01	+.02	44.1	+3.8	82	25	55	24	14	33	46				2.91	+.6	15	7.7	n.	21	s.	28	10	5	15	6.0	6.8	.0	2
Boston [1]	124	33	62	29.86	29.99	+.03	49.7		86	30	58	32	11	41	39	42	35	63	1.59	-1.8	11	11.7	sw.	31	ne.	10	7	13	10	6.0	1.5	.0	1
Nantucket	12	10	63	29.98	30.00	+.03	45.8	+2.4	79	30	53	31	10	39	32	42	40	85	.90	-2.1	12	11.1	sw.	30	ne.	10	13	6	11	5.1	1.8	.0	1
Block Island	26	11	46	29.98	30.01	+.03	45.4	+1.4	75	30	52	32	10	39	27	41	37	77	.85	-2.7	7	14.6	sw.	38	e.	10	11	10	9	4.6	2.0	.0	1
Providence [2]	159	46	60	29.83	30.01	+.03	50.5	+3.9	88	30	60	33	10	41	30	41	35	68	.72	-2.5	7	9.6	sw.	27	sw	15	8	13	9	5.8	1.0	.0	0
Hartford [1]	159	5		29.83	30.01	+.02	50.6		86	30	63	27	14	38	41	43	37	66	.65	-2.7	8	9.6	sw.	26	nw.	12	7	10	13	6.3	.5	.0	2
New Haven [2]	107	74	153	29.91	30.03	+.04	50.6	+3.4	85	30	60	32	11	42	31	43	38	73	1.32	-2.2	7	8.7	s.	27	sw.	15	10	10	10	5.0	3.1	.0	0
Middle Atlantic States							55.8	+4.4										62	1.16	-1.9										4.9			
Albany [1]	97	26	40	29.90	30.00	.00	49.5	+5.1	83	25	60	26	14	39	43	42	35	63	1.85	-.3	13	10.6	n.	36	w.	17	6	10	14	6.5	6.9	.0	1
Binghamton	871	57	79	29.10	30.04	+.02	51.0	+5.6	84	30	62	27	14	40	43	43	36	65	1.70	-.8	12	6.6	w.	20	sw.	15	5	12	13	6.7	4.7	.0	2
New York	314	415	454	29.68	30.02	+.02	53.3	+3.9	87	30	62	33	11	44	30	45	37	60	1.40	-1.8	4	14.7	nw.	45	w.	2	10	11	9	5.1	1.3	.0	0
Harrisburg [1]	374	30	49	29.64	30.05	+.03	56.0		92	30	68	30	14	44	39	46	28	58	1.54	-1.2	8	8.7	nw.	34	nw.	11	7	11	12	6.0	T	.0	1
Philadelphia [2]	114	174	367	29.92	30.05	+.04	56.2	+4.1	88	30	67	36	9	46	35	46	40	64	1.35	-1.7	5	12.9	sw.	33	sw.	2	11	11	8	4.7	T	.0	1
Reading	323	47	306	29.71	30.07		55.8	+5.1	90	30	68	32	14	44	37				1.47	-1.8	6	12.0	nw.	41	e.	16	13	5	12	5.1	T	.0	0
Scranton	805	72	104	29.18	30.05	+.04	52.6	+4.5	86	30	64	28	14	42	37				1.52	-1.2	9	7.4	sw.	22	nw.	21	11	8	11	5.2	8.3	.0	1
Atlantic City	52	37	172	29.99	30.05	+.05	51.7	+3.9	80	16	60	34	13	44	35	45	40	69	1.28	-1.7	3	16.4	s.	47	e.	10	12	8	10	5.1	.0	.0	0
Trenton	190	89	107	29.84	30.04		54.5	+4.7	90	30	66	33	9	43	37	45	38	60	1.27	-1.7	4	9.7	nw.	26	n.	8	9	8	13	5.8	.0	.0	0
Baltimore [2]	123	100	215	29.93	30.06	+.05	58.8	+5.2	87	6	69	37	1	48	37	48	40	60	.88	-2.5	4	10.3	sw.	33	e.	10	11	13	6	4.8	T	.0	0
Washington [1]	112	62	85	29.94	30.06	+.04	59.0	+5.7	92	30	71	35	1	47	36	49	41	59	.54	-2.7	3	7.9	sw.	27	w.	11	11	14	5	4.1	.0	.0	0
Cape Henry	18	8	54	30.05	30.07		57.8	+3.2	93	6	67	39	14	49	40	50	44	67	.52	-2.8	3	11.9	sw.	47	nw.	11	16	10	4	3.4	.0	.0	0
Lynchburg	686	144	184	29.34	30.06	+.07	60.6	+3.3	91	30	74	34	1	47	44	49	39	51	.79	-2.2	2	7.8	nw.	34	nw.	11	16	7	7	4.0	.0	.0	0
Norfolk [2]	91	80	125	29.99	30.08	+.07	60.2	+3.4	90	6	71	36	1	50	33	49	43	65	.73	-2.5	4	9.8	sw.	38	nw.	11	18	7	5	3.6	.0	.0	0
Richmond [2]	144	11	52	29.92	30.07	[illegible]	60.2	+3.6	91	6	73	33	1	47	39	49	41	59	.52	-3.0	2	8.4	sw.	32	nw.	11	17	7	6	3.7	.0	.0	0
South Atlantic States							64.1	+2.4										64	1.05	-2.0										3.4			
Asheville	2,253	89	104	27.76	30.11	+.08	58.5	+4.6	85	30	73	28	12	44	38	47	39	58	1.08	-1.9	4	7.6	nw.	30	nw.	11	14	10	6	4.2	.0	.0	1
Charlotte [2]	779	63	86	29.26	30.09	+.06	64.1	+4.3	89	25	77	33	1	51	35	52	45	60	.88	-2.4	2	7.0	sw.	26	w.	11	17	8	5	3.6	.0	.0	0
Greensboro [1]	886	6	56	29.16	30.10		60.0		90	26	75	28	2	45	42	49	41	58	.55		3	8.3	sw.	30	n.	11	17	6	7	3.8	.0	.0	0
Hatteras	11	5	50	30.08	30.09	+.08	59.0	-.8	77	30	66	43	14	52	21	54	50	77	.51	-3.0	3	11.5	sw.	35	n.	11	17	9	4	3.3	.0	.0	1
Raleigh [1]	376	27	69	29.68	30.08	+.05	62.2	+4.0	90	5	76	35	1	48	39	51	43	58	1.66	-1.8	3	9.0	sw.	32	nw.	11	20	3	7	3.4	.0	.0	1
Wilmington	72	73	107	30.02	30.10	+.07	63.4	+1.4	87	25	74	38	1	53	36	54	49	69	.87	-1.8	2	9.6	sw.	30	s.	9	16	11	3	3.2	.0	.0	0
Charleston [2]	48	11	92	30.04	30.09	+.06	65.9	+1.4	89	25	75	42	12	57	33	56	52	75	.85	-1.7	3	9.8	s.	33	n.	9	15	12	3	3.7	.0	.0	1
Columbia, S. C. [2]	347	70	91	29.71	30.08	+.05	65.9	+2.6	91	27	79	34	1	53	34	56	49	63	2.75	-.1	2	7.9	s.	27	nw.	9	20	8	2	2.7	.0	.0	1
Greenville, S. C. [1]	1,040	70	78	28.99	30.08	------	63.2	+4.6	87	27	76	33	1	51	34	51	42	53	1.00	-2.7	2	8.8	sw.	35	nw.	9	16	10	4	3.8	.0	.0	0
Augusta [2]	182	62	77	29.89	30.08	+.05	66.3	+2.1	92	27	80	36	2	53	37	54	45	53	1.52	-1.6	2	5.4	nw.	24	w.	11	18	11	1	2.8	.0	.0	2
Savannah [2]	65	78	152	30.03	30.10	+.07	68.1	+2.1	93	28	79	44	2	57	33	57	52	69	.28	-2.3	2	10.2	sw.	28	s.	9	17	12	1	2.8	.0	.0	0
Jacksonville [2]	43	86	110	30.05	30.10	+.06	68.4	-.3	91	29	78	43	1	58	30	59	54	73	.14	-2.2	3	7.4	e.	22	w.	10	21	6	3	3.1	.0	.0	1
Florida Peninsula							72.8	-0.6										75	6.47	+4.3										4.0			
Key West [2]	21	10	64	30.01	30.03	+.01	75.0	-.7	87	10	80	63	2	7	18	68	65	76	4.15	+2.9	3	10.8	E.	23	NW.	11	16	10	4	3.6	0.0	0.0	3
Miami [2]	25	124	168	30.01	30.04	+.01	72.8	.0	87	21	79	56	12	67	23	65	62	76	13.62	+10.5	5	10.2	E.	31	SW.	17	14	8	8	4.7	.0	.0	3
Tampa [1]	35	5	61	30.04	30.08	+.02	70.6	-.3	88	29	80	49	2	61	26	62	58	73	1.64	-.4	4	10.4	E.	27	E.	14	14	11	5	3.8	.0	.0	1
East Gulf States							66.2	+0.9										67	1.46	-2.7										4.5			
Atlanta [1]	1,173	5	72	28.86	30.08	+.05	63.8	------	89	27	76	32	1	51	31	52	43	55	1.47	-2.2	1	8.7	NW.	33	NW.	11	15	8	7	4.3	.0	.0	0
Macon [2]	370	79	87	29.69	30.09	+.06	65.0	+1.1	90	27	79	33	1	51	39	53	44	55	1.29	-1.9	2	6.5	N.	24	NW.	11	14	12	4	3.8	.0	.0	1
Thomasville	273	49	58	29.83	30.12	+.09	67.0	+.3	91	33	80	38	1	54	35	----	----	----	.56	-2.8	2	------	------	----	------	----	14	11	5	----	.0	.0	2
Apalachicola	35	11	51	30.05	30.09	------	66.8	-.3	87	30	75	44	1	59	25	60	56	74	.09	-2.7	2	8.7	SE.	27	SE.	14	18	7	5	3.3	.0	.0	1
Pensacola	56	54	79	30.04	30.10	+.08	65.9	-.8	85	19	74	41	1	58	30	59	55	72	1.75	-2.3	3	7.8	SE.	24	W.	9	13	9	8	4.4	.0	.0	2
Anniston	741	9	----	------	------	------	63.8	+3.4	93	30	78	29	1	50	38	----	----	----	1.56	-2.8	3	------	SE.	----	------	----	16	12	2	----	.0	.0	2
Birmingham [2]	700	11	48	29.36	30.10	+.08	65.4	+2.1	91	30	77	33	1	54	31	53	45	61	1.03	-3.8	2	6.8	s.	23	SE.	9	17	3	10	4.2	.0	.0	2
Mobile [2]	57	6	30	30.03	30.09	+.07	66.2	-.1	85	19	76	39	1	56	31	58	53	74	2.20	-2.4	2	9.1	s.	26	s.	9	10	11	9	5.0	.0	.0	3
Montgomery [2]	218	92	105	29.86	30.09	+.06	66.6	+1.3	92	30	78	39	1	55	29	54	47	61	1.82	-2.5	2	6.7	s.	17	NW.	11	15	10	5	3.9	.0	.0	1
Meridian [2]	375	67	92	29.68	30.08	+.06	65.7	+1.7	89	29	78	34	1	53	36	56	50	68	1.58	-3.2	4	6.6	s.	21	E.	14	13	11	6	4.0	.0	.0	2
Vicksburg [2]	247	82	102	29.79	30.05	+.05	67.0	+1.4	89	29	77	40	1	57	27	56	52	76	2.65	-2.5	7	9.0	SE.	23	SW.	9	6	10	14	6.2	.0	.0	8
New Orleans [2]	53	76	84	30.02	30.07	+.07	68.8	.0	84	28	76	45	1	61	23	61	57	75	1.51	-3.7	2	7.3	SE.	19	SE.	24	7	10	13	6.1	.0	.0	2
West Gulf States							67.0	+0.8										79	7.29	+3.6										6.8			
Shreveport [1]	249	92	227	29.74	30.01	+.04	67.2	+2.4	89	26	77	37	1	57	33	59	55	72	10.34	+5.7	10	11.0	SE.	34	SE.	23	5	11	14	6.5	.0	.0	8
Bentonville	1,303	12	51	28.66	30.02	+.06	61.2	+4.3	83	4	71	28	1	51	40	----	----	----	7.59	+3.2	12	9.5	s.	23	SW.	4	7	19	4	6.0	.0	.0	7
Fort Smith	463	57	82	------	29.96	.00	64.8	+3.0	87	29	75	35	1	55	----	----	----	----	7.96	+4.0	11	8.9	e.	29	s.	30	6	13	11	----	.0	.0	4
Little Rock [2]	357	94	102	29.65	30.04	+.06	63.2	+1.1	82	29	72	36	1	55	29	56	52	74	10.76	+5.6	13	8.8	s.	24	se.	25	6	11	13	6.2	.0	.0	9
Austin [2]	605	68	90	29.31	29.94	------	67.4	-.4	84	25	76	45	1	58	32	62	59	79	5.56	+1.2	12	10.9	s.	29	s.	23	5	10	15	6.8	.0	.0	7
Brownsville [2]	57	88	96	29.84	29.90	------	73.6	-.1	95	25	81	49	11	66	27	67	65	81	.10	-1.3	4	14.0	se.	42	se.	23	2	10	18	7.5	.0	.0	3
Corpus Christi [2]	20	11	78	29.91	29.94	-.01	71.2	+.4	84	30	76	55	1	66	19	66	64	85	.21	-1.6	5	13.6	se.	38	s.	28	4	11	15	6.8	.0	.0	2
Dallas [1]	512	6	46	29.40	29.94	------	65.4	+.3	85	26	74	40	1	56	36	59	55	76	12.37	+8.1	15	14.3	se.	40	s.	2	4	9	17	7.3	.0	.0	13
Fort Worth [1]	679	35	56	29.23	29.94	.00	65.6	+1.5	86	4	75	42	1	56	35	59	55	76	16.97	+13.0	17	13.8	se.	42	w.	7	6	8	16	6.8	.0	.0	11
Galveston [2]	54	106	114	29.93	29.99	+.02	67.2	-1.5	76	30	71	52	1	64	16	64	63	88	2.44	-.6	6	13.1	se.	42	se.	7	5	9	16	6.7	.0	.0	6
Houston [2]	138	157	190	29.84	29.99	------	68.3	-1.0	84	17	76	45	1	61	23	62	60	83	5.21	+1.6	6	12.9	se.	46	se.	7	6	5	19	7.1	.0	.0	5
Palestine	510	64	72	29.46	29.99	+.03	66.2	+.2	86	29	74	40	1	58	30	59	55	74	8.78	+4.4	11	9.1	s.	25	se.	19	7	6	17	6.7	.0	.0	9
Port Arthur	34	59	134	29.97	30.01	------	68.3	------	81	17	74	45	1	62	21	63	60	80	10.23	+7.2	7	16.5	se.	55	se.	8	6	11	13	6.2	.0	.0	6
San Antonio [1]	693	28	59	29.21	29.93	.00	69.6	+.5	88	30	79	44	2	60	36	63	60	76	3.48	+.3	8	10.0	se.	45	n.	7	4	7	19	7.3	.0	.0	6

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.	
Ohio Valley and Tennessee							**57.8**	**+3.9**										**65**	**2.92**	**−0.7**										**5.0**			
Chattanooga [1]	762	21	54	29.28	30.10	+.07	61.2	+3.6	93	30	76	30	1	46	43	51	45	65	.44	-----	3	6.2	s.	28	nw.	11	11	11	8	4.9	.0	.0	3
Knoxville [1]	995	66	84	29.04	30.10	+.07	61.6	+3.6	92	30	76	28	12	48	38	50	41	56	.84	−3.3	5	7.5	sw.	34	w.	11	14	10	6	3.8	.0	.0	2
Memphis [2]	399	78	86	29.63	30.05	+.05	63.4	+1.6	85	29	74	32	1	53	34	56	51	71	5.14	+.4	8	7.7	s.	24	sw.	2	11	10	9	5.2	.0	.0	6
Nashville [1]	546	5	72	29.51	30.09	+.08	61.2	-----	89	30	73	30	1	50	36	52	45	62	3.96	−.2	7	8.2	s.	31	sw.	9	9	10	11	5.9	.0	.0	3
Lexington	989	6		29.04	30.12	+.10	57.6	+3.3	91	30	71	26	12	44	37				3.11	−.4	7						20	4	6	3.4	T	.0	1
Louisville [2]	525	106	120	29.52	30.08	+.07	59.5	+3.1	90	30	70	34	12	49	34	50	44	65	3.73	−.2	6	9.1	sw.	32	sw.	2	15	7	8	4.3	T	.0	1
Evansville [1]	431	5	38	29.61	30.08	+.08	57.7	-----	89	30	70	30	12	46	37	50	44	66	3.91	.0	8	8.7	sw.	29	ne.	9	12	8	10	5.3	.0	.0	1
Indianapolis [1]	823	98	129	29.19	30.08	+.08	57.8	+5.7	90	30	68	31	11	48	35	48	43	69	2.82	−.8	8	8.6	s.	30	nw.	11	12	11	7	5.0	T	.0	1
Terre Haute [1]	575	68	149	29.46	30.08	-----	58.2	-----	87	30	69	33	11	48	33	49	44	68	2.95	−.7	7	10.8	s.	33	ne.	1	10	12	8	5.0	T	.0	2
Cincinnati [1]	627	11	51	29.41	30.09	+.08	57.0	+4.6	89	30	68	32	12	46	35	48	42	65	3.20	+.1	7	8.1	sw.	25	nw.	10	13	9	8	4.5	T	.0	2
Columbus [1]	822	90	110	29.20	30.08	+.06	55.5	+4.3	89	30	66	32	12	44	35	47	41	68	2.24	−.6	7	9.5	s.	33	sw.	2	12	8	10	5.1	T	.0	2
Dayton [1]	900	186	213	29.12	30.09	-----	55.6	+4.0	87	30	66	29	11	45	32	47	41	67	1.69	−1.5	7	10.4	sw.	33	nw.	11	9	9	12	5.6	1.0	.0	1
Elkins [1]	1,947	61	78	28.04	30.11	+.08	52.8	+4.0	86	30	66	25	14	39	44	44	41	68	2.33	−1.3	9	6.6	w.	30	w.	11	8	10	12	6.0	1.0	.0	3
Parkersburg	637	77	84	29.40	30.09	+.06	57.2	+3.8	91	30	70	31	13	44	40	48	40	61	1.90	−1.3	7	6.0	nw.	27	nw.	11	13	10	7	4.3	T	.0	2
Pittsburgh [1]	842	39	54	29.16	30.07	+.05	54.6	+4.9	87	26	66	29	12	43	35	46	38	60	3.08	+.2	9	11.5	nw.	34	nw.	11	8	8	14	6.1	1.0	.0	0
Lower Lake Region							**50.4**	**+5.4**										**69**	**2.43**	**−0.1**										**5.7**			
Buffalo [1]	768	243	280	29.21	30.05	+.04	46.8	+4.0	80	26	54	27	11	40	27	42	37	71	2.16	−.4	8	14.8	sw.	44	w.	2	10	10	10	5.6	4.1	.0	1
Canton	448	10	61	29.52	30.00	-----	47.0	+4.5	82	25	56	28	9	38	34	41	36	72	3.09	+.9	13	9.5	sw.	30	w.	14	6	8	16	6.7	7.5	.0	2
Ithaca	836	77	100				50.5	+5.5	83	30	61	30	10	40	39				1.53	−1.0	12	9.6	nw.	27	sw.	6	8	7	15	6.4	5.8	.0	1
Oswego	335	71	85	29.65	30.02	+.01	47.3	+3.7	78	28	55	30	10	39	36	42	36	69	2.76	+.4	13	9.3	w.	22	n.	8	7	10	13	6.2	8.0	.0	1
Rochester [1]	523	5	69		30.05	+.04	50.2	-----	86	28	61	29	13	40					2.60	+.2	13	11.8	nw.	33	w.	2	7	13	10		5.3	.0	2
Syracuse [1]	596	5	51	29.37	30.02	+.01	50.1	+7.1	80	30	60	30	10	40	42	44	38	70	2.43	.0	15	10.8	sw.	32	sw.	2	6	9	15	6.7	7.7	.0	4
Erie [1]	714	57	81	29.30	30.07	+.05	52.0	+6.9	84	30	60	31	11	44	38	44	40	73	2.79	+.1	8	8.4	w.	24	s.	2	10	14	6	5.1	.7	.0	1
Cleveland [1]	762	27	54	29.24	30.07	+.05	52.6	-----	88	30	64	27	13	41	39	45	39	65	2.80	+.4	8	11.0	sw.	32	sw.	2	9	11	10	5.5	.4	.0	
Sandusky	629	5	67				53.4	+6.2	90	30	64	33	1	43	37				2.70	+.2	8	9.6	sw.	27	sw.	2	10	9	11	5.3	.2	.0	1
Toledo [1]	628	79	87	29.39	30.08	+.07	53.8	+6.2	89	30	64	31	12	44	33	45	39	68	2.40	−.2	8	10.1	sw.	35	e.	9	16	7	7	4.1	.8	.0	0
Fort Wayne [1]	857	69	84	29.15	30.08	-----	52.8	+4.1	87	30	65	28	13	41	39	46	41	70	2.49	−.6	8	8.8	sw.	28	nw.	11	9	13	8	5.0	T	.0	2
Detroit [1]	730	5	78	29.28	30.08	+.06	52.9	-----	87	30	64	29	12	42	35	44	37	62	1.45	−1.0	5	10.2	sw.	27	sw.	6	10	6	14	5.8	4.7	.0	0
Upper Lake Region							**48.6**	**+7.2**										**67**	**1.49**	**−1.0**										**5.1**			
Alpena	609	5	89	29.39	30.07	+.05	46.7	+8.1	83	16	57	27	13	37	43	40	38	67	1.79	−.4	8	10.9	nw.	30	nw.	17	11	10	9	4.8	.5	.0	4
Escanaba	612	51	72	29.40	30.08	+.06	44.0	6.1	73	28	52	26	8	36	23	38	33	71	1.94	−.3	8	11.2	s.	29	n.	11	10	9	11	5.1	5.2	.0	2
Grand Rapids [1]	707	70	244	29.29	30.06	+.04	53.6	+6.6	88	30	65	29	12	43	36	44	39	69	.52	−2.2	4	11.9	sw.	44	sw.	5	12	12	6	4.3	2.0	.0	2
Lansing [1]	878	5	90	29.12	30.08	-----	51.4	+5.8	84	30	63	27	12	40	35	44	37	61	.88	−1.7	6	8.9	s.	28	sw.	4	11	11	8	5.0	3.4	.0	1
Marquette	734	44	73	29.23	30.04	+.02	48.4	+10.6	85	24	58	24	9	39	38	40	33	62	2.01	−.4	6	9.8	sw.	31	sw.	28	9	13	8	5.4	6.2	.0	3
Sault Ste. Marie [2]	614	11	52	29.38	30.06	+.03	43.8	+6.4	82	25	54	20	9	33	42	37	33	74	.90	−1.2	6	11.3	nw.	35	sw.	28	10	8	12	5.1	2.6	.0	4
Chicago	673	7	131	29.35	30.08	+.08	53.9	+7.0	91	30	63	28	11	45	35	45	38	63	1.59	−1.2	4	11.5	ne.	26	s.	4	12	9	9	5.1	T	.0	3
Green Bay	617	109	141	29.39	30.06	+.05	50.0	+6.8	80	24	60	24	11	40	34	44	38	67	2.08	−.6	9	11.9	s.	30	s.	4	9	12	9	5.4	.2	.0	5
Milwaukee [1]	681	53	66	29.33	30.07	+.08	49.5	+7.3	81	30	60	25	11	39	42	43	37	68	.81	−1.9	4	13.6	sw.	42	s.	4	8	12	10	5.5	T	.0	3
Duluth	1,133	5	47	28.79	30.03	+.02	44.5	+7.5	80	23	55	17	5	34	35	37	31	68	2.37	+.3	8	12.5	ne.	41	w.	28	8	13	9	5.6	2.4	.0	4
North Dakota							**45.8**	**+5.7**										**70**	**2.20**	**+0.6**										**6.3**			
Fargo [1]	940	5	43	28.93	29.96	−.03	47.8	+7.2	85	23	60	6	8	36	42	41	35	68	4.24	+2.1	6	14.7	s.	45	n.	27	4	14	12	6.5	4.9	.0	4
Bismarck	1,677	4	41	28.13	29.92	−.05	46.2	+6.9	87	14	58	10	8	35	42	40	35	69	2.58	+1.1	9	13.1	se.	36	se.	17	8	12	10	5.7	9.0	.0	2
Devils Lake	1,478	11	44	28.35	29.94	−.05	42.8	+4.0	81	22	52	15	8	34	33	39	35	76	.63	−.9	10	10.8	se.	26	nw.	16	2	11	17	7.6	2.7	.0	0
Lemmon, S. Dak.	2,602	4	38	27.17	29.90	-----	45.9	-----	87	14	57	6	7	34	40	40	34	---	2.57	-----	8	-----	s.	-----	-----	---	7	5	18	----	4.0	.0	3
Grand Forks	832	11	71	29.04	29.96	-----	44.6	-----	81	23	55	16	5	34	39	40	36	---	2.10	-----	6	-----	se.	-----	-----	---	5	13	12	----	2.2	.0	1
Williston	1,878	42	50	27.91	29.90	−.06	46.6	+4.6	87	22	57	16	7	36	40	40	33	65	1.34	+.1	7	9.5	se.	29	se.	17	12	7	11	5.3	T	.0	)
Upper Mississippi Valley							**56.2**	**+5.5**										**63**	**2.22**	**−0.8**										**5.1**			
Minneapolis-St. Paul, Minn. [1]	919	32	61	29.00	30.00	+.01	52.2	-----	81	24	64	25	11	40	35	44	36	61	3.41	+1.2	6	11.8	s.	40	w.	28	7	12	11	5.5	T	.0	
Springfield, Minn.	1,025	4	42	28.88	29.98	-----	51.8	-----	83	23	65	22	8	38	40	44	36	---	2.45	-----	7	-----	s.	-----	-----	---	11	9	10	----	.0	.0	4
La Crosse [1]	714	11	48	29.25	30.02	+.04	54.2	+7.0	86	30	65	28	11	43	34	44	37	63	1.28	−1.1	7	6.3	s.	22	s.	4	10	10	10	5.3	T	.0	6
Madison [1]	974	70	78	29.00	30.06	+.07	52.0	+6.6	86	30	63	25	11	41	32	43	37	65	1.24	−1.5	7	9.4	s.	30	w.	27	10	10	10	5.2	T	.0	6
Charles City	1,015	10	51	28.94	30.03	+.05	52.9	+6.5	84	30	66	26	11	40	37	45	37	62	1.19	−1.3	6	8.0	se.	26	se.	27	13	7	10	4.9	.0	.0	3
Davenport [1]	606	66	161	29.40	30.06	+.08	56.4	+6.5	88	29	67	29	11	46	32	46	39	60	1.15	−1.5	4	10.8	s.	32	sw.	4	14	6	10	5.1	.0	.0	4
Des Moines [1]	860	5	99	29.07	29.99	+.02	56.2	+6.1	85	29	68	28	1	44	37	47	39	60	1.03	−1.9	5	11.5	se.	38	se.	27	12	7	11	5.2	.0	.0	3
Dubuque	699	60	79	29.29	30.04	+.06	55.0	+6.4	87	30	66	28	11	44	34	46	37	57	2.96	+.1	4	7.2	s.	22	nw.	27	12	6	12	5.1	.0	.0	4
Burlington, Iowa [1]	702	6	35	29.27	30.03	+.05	56.0	+3.8	87	30	67	29	11	45	34	47	40	63	2.09	−1.1	6	10.4	s.	34	s.	29	11	7	12	5.5	1.7	.0	6
Cairo	358	87	93	29.69	30.07	+.08	61.3	+3.2	84	29	7	35	1	53	25	-----	-----	---	4.19	+.5	6	9.6	s.	31	sw.	2	7	13	10	6.1	.0	.0	4
Peoria [1]	609	11	45	29.40	30.06	+.07	56.1	+5.2	89	29	67	29	1	45	35	48	42	69	3.51	+.1	9	7.5	s.	22	ne.	9	19	5	6	3.3	T	.0	2
Springfield, Ill. [1]	636	5	191	29.38	30.06	+.08	58.4	+5.7	88	30	69	33	11	48	34	49	44	71	2.34	−1.2	7	12.3	s.	40	nw.	27	11	7	12	5.6	T	.0	3
St. Louis [1]	568	179	303	29.44	30.05	+.07	60.1	+4.0	88	30	70	34	11	50	33	50	42	58	2.19	−1.6	5	13.8	s.	37	sw.	4	14	9	7	4.3	.0	.0	3
Missouri Valley							**56.9**	**+5.6**										**65**	**2.83**	**−0.1**										**5.9**			
Columbia, Mo. [1]	784	6	66	29.18	30.01	+.03	60.4	+5.5	90	30	71	33	11	50	34	50	44	64	2.67	−1.1	10	9.3	s.	24	sw.	4	12	13	5	4.8	T	.0	5
Kansas City [1]	963	38	76	28.95	29.98	+.02	60.5	-----	88	4	71	33	11	50	34	52	44	61	4.58	+1.4	9	13.1	s.	37	sw.	2	9	8	13	5.8	.0	.0	4
St. Joseph [1]	967	11	49	28.95	29.98	-----	59.4	+5.9	93	4	70	30	11	48	38	50	45	70	1.60	−1.6	8	10.7	s.	27	w.	2	10	7	13	5.7	.0	.0	6
Springfield, Mo. [1]	1,324	5	60	28.60	30.00	+.03	59.8	+3.8	85	4	70	29	1	50	37	51	45	68	5.19	+1.3	12	14.2	se.	38	ne.	9	9	7	14	6.0	.0	.0	5
Topeka	987	65	87	28.91	29.96	-----	60.2	+5.5	93	4	71	35	11	49	40	51	46	66	4.16	+1.4	9	11.2	s.	33	sw.	27	6	12	12	6.4	.0	.0	9
Lincoln [1]	1,189	11	81	28.68	29.95	+.01	57.0	+5.5	85	4	69	27	11	45	39	48	43	68	.97	−1.6	5	11.5	s.	41	sw.	27	5	15	10	5.8	.0	.0	2
Omaha [1]	1,105	31	44	28.79	29.97	+.02	56.9	+7.6	86	29	70	26	11	44	42	48	40	61	.52	−2.0	7	14.6	s.	43	sw.	27	7	12	11	5.8	.0	.0	3
Valentine	2,598	46	54	27.19	29.91	−.03	50.5	+4.8	83	14	63	24	11	38	38	43	36	63	3.50	+1.6	9	11.8	s.	32	se.	18	5	11	14	6.5	T	.0	4
Sioux City [1]	1,138	5	27	28.75	29.97	+.02	53.6	-----	87	29	68	22	8	40	46	46	39	63	.45	-----	6	12.1	se.	47	s.	27	7	10	13	6.0	.0	.0	3
Huron	1,301	5	41	28.54	29.94	−.02	51.0	+5.9	84	14	64	22	11	38	41	43	36	66	2.28	.0	5	15.9	se.	53	s.	30	5	13	12	6.2	.0	.0	3
Northern Slope							**48.5**	**+4.3**										**61**	**2.32**	**+0.8**										**6.8**			
Billings [1]	3,570	18	39	26.20	29.86	-----	48.8	-----	81	21	61	24	7	37	45	40	32	58	1.28	-----	7	11.6	sw.	38	nw.	18	1	14	15	7.2	.1	.0	1
Havre	2,507	11	67	27.23	29.87	−.06	47.6	+5.1	85	21	62	19	7	33	43	39	30	58	.36	−.6	9	9.4	nw.	29	sw.	15	6	14	10	6.1	1.4	.0	3
Helena [1]	4,124	5	35	25.68	29.89	−.08	45.6	+2.1	82	21	59	20	6	32	41	38	30	59	.55	−.6	6	10.2	w.	37	sw.	17	3	11	16	6.9	.8	.0	1
Missoula [1]	3,205	80	91	26.52	29.89	-----	49.2	+4.0	80	20	62	27	24	37	41	40	32	60	.66	−.4	8	7.0	e.	27	nw.	21	7	6	17	6.6	T	.0	1
Kalispell	2,973	48	56	26.80	29.85	−.11	45.8	+2.2	76	21	57	28	6	34	40	39	32	62	1.43	+.6	11	6.4	w.	26	n.	6	5	9	16	6.8	1.0	.0	3
Miles City [1]	2,371	48	55	27.39	29.88	−.08	49.8	+5.1	83	21	61	20	7	38	36	42	36	67	.93	−.2	8	7.8	ne.	25	n.	14	4	11	15	7.1	T	.0	0
Rapid City [1]	3,259	50	58	26.51	29.87	−.08	50.1	+5.8	85	14	62	24	7	39	38	42	34	64	4.21	+2.2	12	9.4	n.	30	n.	12	6	11	13	6.3	T	.0	3
Cheyenne [1]	6,094	5	39	23.89	29.85	−.06	45.0	-----	75	14	58	24	1	32	39	37	30	64	5.04	+3.0	12	13.5	nw.	42	n.	23	4	8	18	7.3	22.0	1.0	2
Lander	5,352	60	68	24.54	29.83	−.11	47.2	+4.8	74	21	60	26	2	35	43	38	28	52	1.35	−.7	9	6.5	sw.	36	sw.	5	3	16	11	6.6	3.9	.0	0
Sheridan [6]	3,790	6	42	25.99	29.87	-----	48.0	+4.7	80	17	60	28	3	36	42	40	32	64	1.83	−.1	10	10.1	nw.	36	nw.	18	4	7	19	7.5	T	.0	0
North Platte [1]	2,821	11	51	26.96	29.88	−.04	53.4	+4.8	80	14	65	26	8	42	42	45	39	68	6.83	+4.8	10	9.6	s.	28	se.	18	4	14	12	6.2	.0	.0	6

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature: Mean max.+mean min.÷2	Temperature: Departure from normal	Temperature: Maximum	Temperature: Date	Temperature: Mean maximum	Temperature: Minimum	Temperature: Date	Temperature: Mean minimum	Temperature: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F		°F	°F.	°F.	°F.	%	In.	In.		Miles								0–10	In.	In.	
Middle Slope							57.3	+3.4										67	5.46	+3.2										6.2			
Denver [1]	5,292	106	113	24.60	29.81	−.09	51.5	+5.7	80	14	63	26	8	40	34	41	32	57	4.01	+2.0	10	8.9	s.	39	nw.	30	6	12	12	6.1	6.1	.0	4
Pueblo [1]	4,690	5	36	25.15	29.80	−.08	51.8	-----	83	14	66	20	1	38	49	42	33	60	6.17	+4.9	12	9.9	w.	50	n.	30	5	9	16	6.8	4.7	.0	5
Concordia	1,392	50	58	28.47	29.94	+.01	57.4	+3.9	88	4	68	34	9	46	41	50	43	64	1.65	−.7	7	10.4	s.	27	nw.	27	10	8	12	5.7	.0	.0	5
Dodge City	2,509	10	86	27.28	29.87	−.03	55.6	+2.0	89	4	67	31	9	44	39	49	44	72	5.27	+3.3	10	14.5	s.	40	s.	30	9	6	15	6.4	T	.0	7
Wichita [1]	1,358	6	64	28.49	29.92	−.01	59.0	+2.6	87	4	69	33	1	49	42	52	48	74	7.08	+4.2	14	18.6	s.	51	sw.	27	9	7	14	6.2	.0	.0	8
Oklahoma City [2]	1,214	10	47	28.64	29.91	−.01	62.8	+3.0	89	4	72	33	9	54	34	56	51	75	8.58	+5.3	15	11.0	s.	27	s.	5	9	6	15	6.1	T	.0	6
Southern Slope							63.0	+0.1										64	2.95	+1.1										5.6			
Abilene [2]	1,738	10	56	28.00	29.87	−.03	66.0	+1.6	90	3	77	38	9	55	33	56	51	70	4.65	+1.9	10	12.1	s.	32	nw.	6	12	8	10	5.5	.0	.0	8
Amarillo [2]	3,676	10	49	26.16	29.85	−.02	56.2	+.4	87	4	68	30	8	44	43	48	43	69	3.74	+1.9	11	16.9	sw.	70	sw.	30	11	9	10	5.3	T	.0	4
Del Rio	960	63	71	28.87	29.84	−.05	71.0	+.4	91	27	81	47	9	61	28	62	56	64	.90	−.8	8	11.4	se.	34	nw.	6	6	10	14	6.6	.0	.0	4
Roswell	3,566	75	85	26.26	29.83	−.02	58.6	−2.0	87	4	72	31	9	45	47	48	37	54	2.41	+1.5	9	9.6	s.	40	sw.	6	12	7	11	4.9	4.2	.0	7
Southern Plateau							61.9	+0.1										43	0.89	+0.6										4.1			
El Paso [2]	3,778	82	101	26.07	29.79	−.04	63.6	+.2	85	17	76	38	8	51	35	47	32	40	1.04	+.8	8	9.9	w.	31	sw.	29	13	10	7	4.0	.0	.0	4
Albuquerque [1]	5,314	5	45	24.63	29.78	-----	54.8	+.8	78	14	68	34	1	42	38	44	33	51	1.97	+1.4	10	11.7	s.	56	s.	29	8	11	11	5.4	T	.0	9
Phoenix [2]	1,107	39	87	28.69	29.83	−.04	66.3	−.7	92	10	80	41	30	53	38	51	38	44	.76	+.4	5	6.6	e.	29	w.	22	15	7	8	4.2	.0	.0	3
Tucson	2,555	5	23	27.25	29.84	-----	63.6	-----	92	21	79	37	24	48	40	48	33	40	.79	+.5	3	-----	nw.	-----	-----	-----	13	11	6	3.9	.0	.0	1
Yuma	142	9	54	29.70	29.85	−.04	68.1	−1.4	92	3	82	45	7	54	40	54	41	42	T	−.1	0	7.4	w.	25	w.	6	19	8	3	3.0	.0	.0	0
Independence	3,957	5	26	25.85	29.86	−.04	56.6	+1.5	77	24	70	32	29	43	36	42	24	-----	.76	+.6	3	-----	se.	-----	-----	-----	-----	-----	-----	-----	.0	.0	0
Middle Plateau							49.2	+1.1										53	1.11	+0.1										6.1			
Reno [2]	4,527	61	76	25.36	29.89	−.08	47.6	+.1	75	21	60	28	18	35	39	38	27	55	.27	−.2	5	7.8	w.	33	s.	13	11	11	8	4.9	T	.0	0
Tonopah	6,090	9	20	23.92	29.84	-----	46.8	-----	68	2	58	21	29	36	33	36	25	-----	.51	-----	7	-----	nw.	-----	-----	-----	7	15	8	-----	.2	.0	0
Winnemucca	4,339	5	56	25.52	29.88	−.08	47.8	+1.1	77	20	62	20	24	33	44	38	26	51	1.08	+.2	10	8.7	sw.	31	s.	13	5	9	16	6.7	T	.0	1
Modena	5,473	10	46	-----	-----	-----	45.9	−.1	74	21	61	22	30	31	44	-----	-----	-----	1.50	+.7	7	11.2	sw.	39	sw.	27	7	11	12	5.8	1.5	.0	4
Salt Lake City [1]	4,227	86	47	25.49	29.85	−.07	50.6	+2.7	79	21	63	30	27	38	37	42	32	56	1.33	−.4	8	10.7	se.	42	se.	4	2	19	9	6.6	T	.0	3
Grand Junction	4,602	60	68	25.25	29.80	−.08	54.2	+1.8	78	21	66	33	2	43	37	43	32	49	1.26	+.4	10	7.6	se.	27	sw.	16	6	8	16	6.6	.0	.0	4
Northern Plateau							51.5	+1.7										57	1.01	0.0										6.9			
Baker [2]	3,471	36	54	26.32	29.89	−.11	46.8	+1.6	77	21	59	24	24	34	38	39	31	63	1.33	+.2	11	6.8	se.	26	sw.	16	3	15	12	6.6	5.1	.0	2
Boise [1]	2,739	5	49	27.04	29.87	−.11	51.8	-----	84	21	64	25	24	40	36	43	34	56	1.28	-----	11	12.0	se.	46	w.	24	6	12	12	6.4	T	.0	1
Pocatello [1]	4,478	5	31	25.36	29.87	−.07	47.6	-----	77	21	61	24	2	34	43	39	29	55	1.12	-----	11	10.9	sw.	35	s.	14	3	13	14	6.8	4.8	.0	0
Spokane [1]	1,929	27	42	27.83	29.87	−.12	49.8	+1.4	83	20	63	28	23	37	43	42	34	61	.98	−.2	9	7.9	s.	29	sw.	21	5	7	18	6.9	T	.0	0
Walla Walla	991	57	65	28.82	29.88	−.13	55.3	+2.2	85	20	66	36	23	45	35	-----	-----	-----	1.27	−.2	8	6.8	s.	30	w.	13	3	9	18	7.3	T	.0	2
Yakima	1,076	58	67	28.73	29.88	-----	54.0	+1.5	82	20	66	33	25	42	32	44	33	50	.45	.0	4	6.5	nw.	24	nw.	21	3	13	14	7.2	.0	.0	0
North Pacific Coast Region							51.6	+2.1										72	2.25	−0.8										7.9			
North Head	211	5	56	29.71	29.94	−.11	49.6	+2.1	62	10	55	41	24	45	19	46	44	83	3.76	−.4	18	13.7	s.	63	s.	16	0	7	23	8.6	.0	.0	0
Seattle [2]	125	90	321	29.78	29.91	−.12	52.7	+3.3	73	19	60	39	23	45	24	46	40	67	1.61	−.8	13	9.7	s.	42	s.	16	3	9	18	7.4	.0	.0	1
Tacoma	194	172	201	29.71	29.92	−.11	52.0	+3.3	73	20	60	38	17	44	25	-----	-----	-----	1.49	−1.3	12	9.2	sw.	42	s.	16	1	9	20	8.3	.0	.0	1
Tatoosh Island	86	9	61	29.81	29.91	−.09	48.4	+2.3	60	19	53	40	22	44	17	45	42	79	4.10	−1.5	19	14.5	e.	53	sw.	16	1	5	24	8.5	.0	.0	0
Medford [1]	1,329	20	58	28.52	29.93	-----	51.6	−.5	79	20	65	30	18	38	43	44	36	62	.86	−.4	7	-----	nw.	-----	-----	-----	2	11	17	7.6	.0	.0	0
Portland, Oreg. [1]	154	68	106	29.76	29.93	−.13	54.2	+2.4	79	19	63	41	26	46	31	48	43	73	1.98	−.9	14	5.6	nw.	27	sw.	16	3	8	19	7.5	.0	.0	0
Roseburg	510	45	76	29.40	29.95	−.12	52.6	+1.6	81	20	64	33	18	41	40	46	40	69	1.94	−.3	13	4.1	nw.	27	sw.	16	1	10	19	7.7	.0	.0	1
Middle Pacific Coast Region							55.0	−0.7										72	4.68	+2.4										7.0			
Eureka	60	72	88	29.93	30.00	−.11	51.6	+1.7	67	9	57	39	28	46	17	48	44	77	4.05	+.7	15	9.8	n.	32	sw.	13	3	8	19	7.6	.0	.0	0
Redding [1]	722	20	34	29.16	29.94	-----	55.6	−4.2	85	20	65	38	29	46	33	48	41	64	6.45	+3.8	13	8.1	nw.	31	se.	14	4	8	18	7.5	.0	.0	2
Sacramento [2]	66	92	115	29.87	29.94	−.07	57.1	−1.0	78	24	66	40	29	48	31	51	46	72	4.58	+3.1	13	8.5	se.	28	nw.	23	6	12	12	6.0	.0	.0	2
San Francisco	155	112	132	29.79	29.96	−.09	55.6	+.6	74	19	61	47	28	50	23	50	46	74	3.65	+2.0	11	9.6	w.	32	s.	13	7	5	18	6.9	.0	.0	2
South Pacific Coast Region							59.6	−0.2										69	1.72	+0.8										6.4			
Fresno [1]	327	5	35	29.60	29.96	−.03	59.8	−.4	84	19	72	36	29	48	38	52	45	63	1.32	+.4	10	6.8	nw.	27	nw.	23	6	8	16	6.5	.0	.0	2
Los Angeles	338	223	250	29.60	29.96	−.03	59.4	.0	80	19	67	46	22	52	25	53	47	69	2.44	+1.4	11	7.4	w.	26	w.	29	7	11	12	6.4	.0	.0	0
San Diego	87	20	55	29.88	29.98	−.01	60.2	-----	80	3	67	46	30	53	29	55	51	75	1.40	+.6	14	7.4	w.	22	s.	10	5	12	13	6.4	.0	.0	0
West Indies																																	
San Juan, P. R.	82	10	54	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panama Canal																																	
Balboa Heights	118	6	92	-----	[3] 29.84	-----	82.8	+1.2	95	9	91	72	28	75	21	-----	-----	-----	2.25	−.6	7	8.0	nw.	22	nw.	22	1	23	6	-----	.0	.0	3
Cristobal	36	6	97	-----	[3] 29.85	-----	82.2	+.4	89	29	86	75	22	78	11	-----	-----	-----	8.33	+4.2	17	10.4	n.	22	n.	5	1	9	20	-----	.0	.0	3
Alaska																																	
Anchorage	135	36	47	[4] 29.52	[4] 29.66	-----	38.7	+3.2	53	19	46	24	4	31	21	35	30	70	.81	+.4	6	4.6	n.	16	se.	25	4	5	21	7.7	2.0	.0	--
Barrow	25	4	27	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	--
Bethel	22	5	32	[4] 29.53	[4] 29.57	-----	33.6	+5.9	51	21	40	21	29	27	25	32	28	75	1.18	+.6	13	-----	s.	-----	-----	-----	2	4	24	8.6	4.6	.0	--
Fairbanks	484	11	87	[4] 29.18	[4] 29.71	-----	34.9	+6.2	50	30	46	−2	1	24	37	31	24	65	.07	−.2	4	5.7	e.	20	e.	9	5	11	14	6.5	.5	.0	--
Juneau	132	96	116	[4] 29.66	[4] 29.75	-----	42.5	+2.1	57	27	49	29	6	36	22	38	32	71	4.65	−.7	21	6.6	s.	26	e.	11	4	2	24	8.3	T	.0	--
Ketchikan	75	69	85	[4] 29.75	[4] 29.77	-----	44.0	+1.5	60	6	50	30	13	38	28	41	36	76	14.00	+3.0	21	8.5	se.	27	se.	10	3	3	24	8.2	T	.0	--
Nome	43	25	51	[4] 29.58	[4] 29.60	-----	26.9	+9.7	39	8	32	7	18	21	23	26	23	79	2.00	+1.3	11	13.1	ne.	34	sw.	3	4	4	22	8.4	14.5	10.9	--
Hawaiian Islands																																	
Honolulu	38	86	100	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

LATE REPORT FOR DECEMBER 1941

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F.		°F.	°F		°F.	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.	
Barrow, Alaska	25	4	27	[4] 29.72	[4] 29.74	......	-4.8	+6.9	19	8	1	-33	21	-1	24	-5	-7	90	.22	.0	9	16.9	e.	54	e.	29	10	6	15	5.9	4.2	6.0	

LATE REPORT FOR FEBRUARY 1942

District and station	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Total	Departure from normal	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
Barrow, Alaska	25	4	27	[4] 30.07	[4] 30.08	......	-9.5	+7.1	14	16	-3	-32	9	-16	23	-9	-11	90	.15	.0	7	13.8	e.	36	se.	14	6	8	14	6.7	1.2	9.0	..

LATE REPORTS FOR MARCH 1942

District and station	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Total	Departure from normal	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Thunderstorms
Alaska																																	
Anchorage	135	36	47	[4] 29.45	[4] 29.60	......	25.4	+1.6	46	28	32	-1	22	18	26	24	19	72	0.45	-0.1	6	6.5	n.	27	s.	5	6	6	19	7.2	4.4	2.0	..
Barrow	25	4	27	......	......	......	......	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..
Bethel	22	5	32	[4] 29.58	[4] 29.62	......	10.2	-1.8	35	24	21	-23	17	-1	51	11	5	72	.69	-.1	10	......	n.	...	...	...	9	7	15	6.3	8.4	6.3	..
Fairbanks	484	11	87	[4] 29.20	[4] 29.75	......	8.1	-1.5	39	5	24	-28	21	-8	49	9	8	73	.29	-.4	6	4.8	e.	19	e.	9	8	8	15	6.1	4.2	9.4	..
Ketchikan	75	69	85	[4] 29.82	[4] 29.84	......	39.5	+1.6	60	30	45	23	23	34	19	37	33	77	15.25	+3.	25	6.5	se.	28	se.	1	0	3	28	9.1	6.1	.0	..
Nome	43	25	51	......	29.68	......	7.5	-1.2	28	9	15	-20	17	0	24	...	...	74	.76	-.1	11	......	ne.	36	e.	23	8	5	18	......	8.3	21.3	..

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken bihourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometric data from airport records, other data from city office records.
[6] Wind, clear, partly cloudy, and cloudy data from city office records, other data from airport.

NOTE.—Except as indicated by notes 1, 2, 5, and 6, data in table are city office records.

SEVERE LOCAL STORMS, APRIL 1942

[Compiled by Mary O. Souder]

The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Santa Fe, N. Mex., vicinity of	5				$1,000	Heavy rain	Loss to the Park View Hatchery.
Minnesota, southwestern Counties.	5				5,000	Sleet and glaze	Damage to overhead wire systems.
Boonsville, Tex	6	2 p. m.		0		Tornado	Several buildings demolished; no estimate of damage given.
Alva, Okla	6	5:30 p. m.	[1] 5		25,200	Heavy hail and rain.	Storm moved from the northwest and hail fell over spotted portions of an area about 14 miles long. Some damage resulted from washing and flooding. Property damage, $25,000; loss in wheat and barley, $200.
Canton, Okla	6	5:30-6 p. m.	[1] 3		8,000	Hail	Storm moved from the southwest. Property damage, $8,000; crop loss small; path 12 miles long.
Capron, Okla	6	6 p. m.	[1] 4		3,050	Hail and rain	Storm moved from the north. Property damage, $2,000; loss to crops, $50.
Eagle Pass, Tex	6	6:15 p. m.	[1] 3		260,000	Heavy hail and wind.	Crop loss, $250,000; property damage from hail, $5,000 and from wind, $5,000.
Dimmit County, Tex., northern portion.	6	7 p. m.	[1] 2		130,000		Property damage, $25,000; crop loss from hail, $100,000, from wind, $5,000.
Coleman, Tex., 15 miles south.	6	do	[1] 2		5,000	Straight-line-wind	Property damaged.
San Angelo, Tex	6	8:15 p. m.	[1] 5		8,000	do	Four airplanes in open flying field damaged.
La Pryor, Tex	6	10:30 p. m.	3		8,000	Heavy hail	Chief loss to crops.
Amarillo, Tex	7-8	8 p. m. 7th-3 p. m., 8th.			65,000	Glaze	Principal loss to communication and power facilities; negligible loss to crops and livestock.
Tallulah, La., vicinity of	8	1-2 p. m.	70			Wind	Five mules killed, number of frame buildings destroyed, and 4 persons injured, none seriously.
Redwillow County, Nebr	18	P. m.				Heavy rain and local floods.	Flash floods in several creeks; highways and farmlands flooded; streets and basements flooded in Indianola and Bartley.
Morrison, Colo	22	5:30 p. m.	33		2,500	Wind	Portion of a flat timber roof of a schoolhouse ripped off; some damage to nearby residences by flying debris.
Alburquerque, N. Mex	22	P. m.				do	2 planes demolished and 40 damaged; amount of loss not estimated.
Breckenridge, Tex	23	2 p. m.		1	3,000	Straight-line-wind	Property damage.
Marlin, Tex	23	7:30 p. m.	[1] 1		4,000	do	Utility lines and small buildings damaged.
Entrance to Columbia River	24	A. m.		1	35,000	Wind	2 boats ran aground at 4 a. m.; a man drowned. Maximum velocity at North Head during the night of the storm, 40 miles per hour.
Eastland, Tex	24	4:30 p. m.	1,320		100,000	Heavy hail	Most of the damage to buildings and automobiles; crop loss small, but not estimated.
Taylor and Callahan Counties, Tex.	26	P. m.	[1] 3			do	Property damage in thousands of dollars; crop loss negligible.
Nebraska, eastern portion	27	11 a. m.-10 p. m.	[1] 100			Wind and dust	A warehouse, under construction by the U. S. Army, at the Lincoln Municipal Airport wrecked, injuring 7 workmen and breaking several windows and a neon sign. Near Fort Crook, high wind and blowing dust caused accidents resulting in injury to 10 persons. In the vicinity of Falls City an oil well toppled, small buildings were damaged, trees uprooted, and 1 person injured. Near Lynch, outbuildings on 3 farms were damaged with minor loss in other localities. Throughout the eastern third of the State, considerable dust in the air reduced visibility somewhat, becoming dense locally.
Ortonville, Clinton, Graceville, and Dumont, Minn., and vicinity.	27	3:10 a. m.		2	193,000	Tornado with heavy hail.	Property damaged; small loss to growing crops; 7 persons injured.

[1] Miles instead of yards.

SEVERE LOCAL STORMS APRIL 1942—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Pryor, Okla., and vicinity	27	3:45 p. m.	440	50	2,300,000	Tornado and torrential rain.	The storm moved from the southwest and wrought widespread destruction. The center passed directly over the main portion of the city including the principal business section and its rotating winds were of sufficient violence to demolish dozens of frame and several brick buildings, including the First Baptist Church. Torrential rains accompanied the tornado and water knee deep surged down the main street. Communication and power lines were wiped out completely for a distance of 15 miles around Pryor and floodwaters interfered greatly with relief and rescue work and resulted in the necessary closing of some of the highways leading into the city. After leaving Pryor the tornado struck in a few spots northeast of the city, completely wrecking everything in its path. After the fury of the storm had subsided, several airplane loads of doctors and nurses were rushed from Tulsa and Muskogee to care for the injured. The State highway patrol officials took an active part in the rescue work, funds for which were made immediately available by the Governor and Federal officials. Hundreds of cars and trucks and several pushers and cranes were rushed to the scene by the U. S. Army and the Du Pont Powder Co., from the Federal munitions project a few miles south of the city to assist in the search for the dead and missing persons and in removing the debris and tearing down partially wrecked buildings with dangerous, leaning walls. A staff of American Red Cross officials were dispatched to the scene of the disaster to take charge of the rescue work. 192 injured persons required hospitalization; path 7 miles long.
Crowell, Tex	28	9:30 p. m.	[1] 1	11	1,500,000	Tornado	75 percent of damage within the city proper. 250 persons injured; no crop loss reported.
Santa Fe National Forest, N. Mex.	29				3,600	Wind	Lumber destroyed.
Santa Rosa, N. Mex	29					do	Property damaged.
Albuquerque, N. Mex	29	P. m.			1,000	do	Property damaged.
Wallace, Nebr	29	do	440	0	5,000	Tornado	Farm buildings damaged or destroyed.
Kidder, S. Dak., vicinity of	29	7 p. m.		1		do	Buildings damaged; 1 person killed and 4 injured on 1 farm with some damage to buildings on 2 other nearby farms. A funnel cloud observed; path narrow.
Butte and Anoka, Nebr	29	10 p. m.	440	0	28,000	do	Buildings on 12 farms struck with some livestock killed. Other damage to buildings and trees.
Eads, Colo	30	2 a. m.	100-2,200	4	50,000	do	Storm developed near McClave and traveled northeasterly for approximately 35 miles, destroying all buildings including a schoolhouse, granaries, and farm residences and uprooting trees in its path. 300 yards of Missouri-Pacific track wrecked. Some hail preceded the storm. 1,100 turkeys, 500 chickens, and 40 sheep killed.
Sayre, Okla	30	4 a. m.	[1] 1		500	Wind	Brick wall of a building blown over and several plate-glass windows broken, otherwise little damage resulted.
Airport, Clinton, Okla	30	5:15 a. m.	30	0	9,000	Tornado	Hangar destroyed and 6 small airplanes stored there damaged. Storm then disappeared without causing further damage. Path 3 miles long.
Snyder, Okla	30	5:30 a. m.	50	0	1,000	do	The storm approached from the southwest causing property damage over a path 880 yards long.
Castlewood, S. Dak	30	7:45 p. m.		1		do	Several buildings wrecked; 1 person killed when timber from a wrecked barn was hurled through the window of a residence; path narrow.
Murdock, Minn., and vicinity.	30				3,000	Thundersquall	Property damaged.
South Dakota, eastern and southern portions.	30					Heavy rain and high wind.	Traffic disrupted due to wash-outs weakening roadbeds. Lakes and small streams reached flood stage. Trees and signs blown down.

LATE REPORTS FOR MARCH, 1942

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Erie, Pa	16			1	$50,000	Rain	Streams rose, flooding roads. Highways and railroad tracks washed out causing delay in travel.
Minnesota, extreme southwestern counties.	19-20				50,000	Snow	Heavy, moist snow clung to wires and froze to wires, trees, and bushes. Beginning to form about 3 a. m., of the 20th, it remained on the wires about 36 hours. Much damage to trees and shrubbery. The moisture was very beneficial because of the unusually high water content which was badly needed.
Hanover, Pa., and vicinity	29				15,000	do	Property damaged; minor loss to utilities.
Shippensburg, Pa	29				20,000	do	Building collapsed.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR APRIL 1942

[Solar Radiation Investigations Section, I. F. HAND in charge]

SOLAR RADIATION OBSERVATIONS

Explanations of the tables, and references to descriptions of instruments, stations and methods of observation, and to summaries of data, are given in the January 1942 REVIEW, p. 20.

TABLE 1.—*Solar radiation intensities during April 1942*

[Gram-calories per minute per square centimeter of normal surface]

MADISON, WIS.

Date	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass A. M.					Air mass P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Apr. 17	4.95	0.71	0.83	0.98	1.21	1.48	1.22				5.16
Apr. 21	4.37		.76	.83	1.06	1.34					4.37
Apr. 22	4.37		.64	.76	1.03	1.30					5.16
Apr. 23	5.36		.64	.77	1.01	1.30	1.04				4.95
Apr. 24	5.36		.48	.58	.61	.91					5.56
Apr. 28	6.50	.65	.75	.95	1.10	1.40					7.29
Means		(.68)	.68	.81	1.00	1.29	(1.13)				
Departures		(−.09)	−.22	−.23	−.19	−.14	(−.06)				

LINCOLN, NEBR.

Date	7:30 a. m. (e.)	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	1:30 p. m. (e.)
Apr. 1	3.63				1.14	1.44					7.04
Apr. 3	4.17		0.70	0.92		1.46	1.17				10.21
Apr. 9	3.45					1.45	1.16	0.94	0.77	0.60	3.45
Apr. 11	2.62				1.20						3.45
Apr. 16	10.97						1.14	.99	.84	.75	11.58
Apr. 21	4.57						1.12	.92	.79	.64	5.51
Apr. 22	4.95				1.08	1.41	1.10	.94	.82	.67	8.86
Means			(0.70)	(0.92(	1.14	1.44	1.14	.95	.80	.66	
Departures			(−.13)	(−.06)	−.05	−.02	−.04	−.01	−.02	−.03	

BLUE HILL, MASS.

Date	7:30 a. m. (e.)	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	1:30 p. m. (e.)
Apr. 1	4.2			0.56							3.8
Apr. 2	3.8	0.69	0.82	.86	0.95				0.43	0.28	3.8
Apr. 3	4.6							0.34	.29	.23	4.0

TABLE 1.—*Solar radiation intensities during April 1942*—Continued

BLUE HILL, MASS.—Continued

Date	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass A. M.					Air mass P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Apr. 4	5.3					0.76					5.2
Apr. 6	2.3			.95			0.78	.58	.46		6.0
Apr. 8	6.0					1.41					2.6
Apr. 12	3.8					1.39					3.0
Apr. 14	3.0	.84	.94	1.06		1.33					3.2
Apr. 16	6.3							.95	.85	.74	6.0
Apr. 18	5.2				1.20	1.35					4.6
Apr. 22	4.6							.95	.71	.60	4.0
Apr. 23	3.8	.78	.88	1.01			1.12	.98	.84	.73	4.4
Apr. 24	4.2				1.10		.95	.80			5.0
Apr. 25	3.8				.99	1.20	.86	.67	.51	.41	5.2
Apr. 26	6.3		.52	.69	.96				.93	.86	4.0
Apr. 27	4.7				1.28	1.39	1.07				3.4
Apr. 28	5.2	.47	.58	.64	.76	.91					4.4
Apr. 30	7.1	.62	.73	.84	.99			.69	.44	.26	5.8
Means		.68	.75	.83	1.03	1.22	.96	.75	.61	.52	
Departures		−.13	−.15	−.21	−.15	−.16	−.15	−.19	−.19	−.12	

ALBUQUERQUE, N. MEX.

Date	7:30 a. m. (e.)	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	1:30 p. m. (e.)
Apr. 1	3.15	0.82	0.95	1.12	1.28	1.53	1.22	1.06	0.92	0.82	3.63
Apr. 2	3.45	.87	1.00	1.14	1.30						3.00
Apr. 3	2.74	.84	1.04	1.18	1.35						3.30
Apr. 5	7.57	.92	1.03	1.16	1.26	1.53					4.75
Apr. 8	4.95				1.33	1.53	1.31	1.17		.96	3.81
Apr. 9	5.36	.94	1.03	1.16	1.32	1.55	1.34	1.19	1.08	.98	4.37
Apr. 13	6.76	.83	.94	1.06	1.24		1.23	1.04	.94	.82	7.29
Apr. 14	6.27			1.08	1.24	1.52	1.30	1.12		.90	5.36
Apr. 15	4.17	.98	1.05	1.18	1.33		1.32	1.14	1.04		4.95
Apr. 20	5.79	.99	1.07	1.18	1.33						5.36
Apr. 21	6.27	.74	.86	1.01	1.20	1.44			.91	.80	6.76
Apr. 25	4.17					1.58	1.36	1.19	1.08	1.01	3.15
Apr. 26	3.63	.91	.99	1.15	1.33						3.00
Apr. 27	4.75	.81	.92	1.07	1.28	1.51	1.29	1.10			3.99
Apr. 29	3.15			1.16	1.32	1.49					3.00
Means		.88	.99	1.13	1.30	1.52	1.30	1.13	1.00	.90	

*Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct and diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Cambridge	Nashville	Twin Falls	La Jolla	New Orelans	Riverside	Blue Hill	Friday Harbor	Ithaca	Newport	State College
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Apr. 2	556	430	506	365	482	507		515	528	560		612	563	534	491	376	514	532
Apr. 3	304	565	527	579	166	268		414	528	336			468	430	545	225	172	292
Apr. 4	477	442	493	516	311	274		338	529	139		646	455	351	556	189	311	166
Apr. 5	384	288	180	339	311	436		294	501	498		470	419	294	553	171	271	394
Apr. 6	417	98	255	127	417	338		448	439	556		378	350	481	179	450	464	438
Apr. 7	389	329	302	110	275	536		387	232	578			593	420	337	136	384	208
Apr. 8	206	412	364	338	585	396		594	146	530			435	574	524	600	558	459
Mean	**391**	**366**	**375**	**339**	**364**	**394**	**304**	**427**	**415**	**457**		**527**	**469**	**440**	**455**	**307**	**382**	**356**
Apr. 9	45	269	575	120	44	359		228	147	568		540	339	199	306	162	144	74
Apr. 10	92	568	400	451	76	198		78	101	329		212	120	88	455	87	86	55
Apr. 11	389	560	490	540	215	508		117	634	543		614	420	120	238	309	116	264
Apr. 12	423	447	465	455	442	586		477	363	552		651	480	482	556	496	533	453
Apr. 13	633	552	511	551	627	369		440	147	504		439	378	484	175	647	528	647
Apr. 14	583	446	556	459	528	565		529	489	285		542	278	553	266	360	501	522
Apr. 15	482	543	475	573	462	621		156	579	626		169	615	179	425	348	361	409
Mean	**378**	**484**	**496**	**450**	**342**	**458**	**400**	**289**	**351**	**487**		**426**	**376**	**301**	**346**	**344**	**324**	**346**
Apr. 16	560	298	569	564	431	369		451	558	208		214	216	531	263	467	554	442
Apr. 17	377	651	517	598	433	444		461	384	247		372	440	451	460	327	417	365
Apr. 18	623	516	367	527	576	619		468	645	654		309	633	528	520	74	633	303
Apr. 19	493	642	378	718	360	646		261	663	657		486	638	239	412	142	339	168
Apr. 20	264	590	408	679	273	397		151	671	578		478	457	158	553	154	283	306
Apr. 21	484	603	567	722	301	486		184	592	547		511	96	211	330	166	344	445
Apr. 22	657	592	575	609	580	507		606	671	311		644	315	586	403	659	663	698
Mean	**494**	**556**	**483**	**631**	**422**	**496**	**453**	**369**	**598**	**457**		**431**	**399**	**386**	**420**	**284**	**462**	**389**

TABLE 2.—*Daily totals and weekly means of solar radiation (direct and diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Cambridge	Nashville	Twin Falls	La Jolla	New Orleans	Riverside	Blue Hill	Friday Harbor	Ithaca	Newport	State College
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Apr. 23	622	599	531	638	602	680	-------	586	518	583	-------	466	633	628	365	76	648	688
Apr. 24	612	503	251	556	549	664	-------	536	521	654	-------	338	674	599	546	635	632	663
Apr. 25	574	318	371	378	560	660	-------	559	504	579	-------	376	653	528	318	590	642	589
Apr. 26	526	162	433	239	558	673	-------	600	188	511	-------	623	360	613	370	632	638	608
Apr. 27	507	395	439	602	626	203	-------	656	604	196	-------	562	412	698	433	539	704	390
Apr. 28	377	654	523	628	461	479	-------	557	91	327	-------	248	473	583	240	524	620	551
Apr. 29	437	418	527	480	292	632	-------	459	538	492	-------	458	688	450	280	645	464	615
Mean	522	556	439	503	521	570	278	565	430	477	-------	439	556	586	364	520	621	586
DEPARTURES FROM WEEKLY NORMALS																		
Apr. 2	+21	−2	−13	+35	+17	−102	−28	+35	-------	−40	-------	+127	0	+54	+110	+43	−18	−38
Apr. 9	−18	+80	+63	+91	−9	−84	+36	−86	-------	+27	-------	0	−63	−51	0	+59	−90	−80
Apr. 16	+76	+154	+40	+270	+25	−83	+79	−19	-------	−97	-------	+22	−110	−4	−40	−4	+24	−85
Apr. 23	+71	+114	+6	+104	+60	+8	−88	+153	-------	−103	-------	+43	+101	+24	−116	+61	+154	+43
	+1050	+2422	+672	+3500	+651	−1827	−7	+581	-------	−1491	-------	+1344	−504	+161	−322	+1113	−490	+1120
ACCUMULATED DEPARTURES ON APRIL 29																		
	+2870	−504	−2359	+2758	+1583	−140	−861	+91	-------	+889	-------	+5929	+3318	−882	+1862	+903	−497	-------

POSITIONS, AREAS, AND COUNTS OF SUN SPOTS FOR APRIL 1942

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1942	h m		°	°	°	°				
Apr. 1	10 38	(*)	−43	94	+13	48	24	3	VG	U.S.Naval.
		7403	−34	103	+10	38	48	4		
		7404	+25	162	−3	26	48	4		
		7397	+61	198	+9	63	242	7		
		7397	+70	207	+9	71	97	8		
				(137)	(−7)		459	26		
2	10 39	7403	−29	95	+13	35	36	3	VG	Do.
		(*)	−23	101	+5	27	24	4		
		7403	−20	104	+10	26	48	4		
		7404	+38	162	−3	39	48	3		
		7397	+74	198	+9	76	145	4		
				(124)	(−6)		301	18		
3	10 35	(*)	−20	91	+18	31	24	4	VG	Do.
		7403	−15	96	+13	24	24	3		
		7403	−7	104	+10	18	48	10		
		7407	+9	120	+7	17	24	2		
		7404	+55	166	−2	56	12	2		
		7397	+88	199	+10	88	73	1		
				(111)	(−6)		205	22		
4	10 35	7408	−73	24	+2	74	145	4	G	Do.
		7403	0	97	+13	19	24	5		
		7403	+5	102	+9	17	24	2		
		(*)	+5	102	+5	13	12	1		
		7407	+23	120	+7	28	48	5		
				(97)	(−6)		253	17		
5	11 15	7408	−60	24	+2	61	97	3	F	Do.
		7407	+37	121	+6	40	24	2		
				(84)	(−6)		121	5		
6	10 37	7408	−48	23	+2	50	97	5	VG	Do.
		7409	−40	31	−8	40	48	4		
				(71)	(−6)		145	9		
7	10 49	7408	−35	23	+2	36	97	10	VG	Do.
		7409	−26	32	−8	26	339	19		
				(58)	(−6)		436	29		

POSITIONS, AREAS, AND COUNTS OF SUN SPOTS FOR APRIL 1942—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1942	h m		°	°	°	°				
Apr. 8	11 52	7408	−21	23	+1	23	48	4	F	U. S. Naval.
		7409	−12	32	−8	12	339	19		
				(44)	(−6)	------	387	23		
11	10 6	7412	−82	283	+8	82	194	1	F	Do.
		7411	−72	293	+15	74	24	1		
		7410	+5	10	+8	16	12	1		
		7410	+8	13	+3	13	12	3		
		7408	+19	24	−1	20	24	3		
		7409	+29	34	−7	29	679	26		
				(5)	(−6)		945	35		
12	11 44	7412	−68	283	+8	70	194	1	F	Do.
		7411	−58	293	+14	62	48	1		
		7413	−48	303	+13	52	48	5		
		7409	+43	34	−7	43	776	10		
				(351)	(−6)		1,066	17		
13	10 52	7412	−55	284	+8	58	194	1	F	Do.
		7411	−46	293	+14	51	145	8		
		7413	−34	305	+12	40	145	11		
		7409	+56	35	−7	56	824	10		
				(339)	(−6)		1,308	30		
14	10 27	7412	−41	285	+8	45	194	1	G	Do.
		7411	−32	294	+14	38	145	12		
		7413	−20	306	+12	28	145	14		
		7409	+70	36	−8	70	776	9		
				(326)	(−6)		1,260	36		
15	11 35	7414	−71	241	−5	71	48	4	VG	Do.
		(*)	−50	262	−10	50	48	2		
		7412	−28	284	+8	32	194	1		
		7411	−18	294	+13	27	145	16		
		7413	−7	305	+11	19	242	22		
		7409	+85	37	−7	85	485	6		
				(312)	(−6)		1,162	51		
16	11 56	7414	−57	241	−5	57	24	5	VG	Do.
		7415	−36	262	−10	36	48	8		
		7412	−14	284	+9	21	194	1		
		7411	−5	293	+14	22	388	24		
		7413	+7	305	+12	20	388	26		
				(298)	(−6)		1,042	64		
17	10 45	7415	−23	263	−11	24	48	2	F	Do.
		7412	−1	285	+9	14	194	1		
		7411	+10	296	+13	21	436	22		
		7413	+20	306	+12	27	388	19		
				(286)	(−5)		1,066	44		

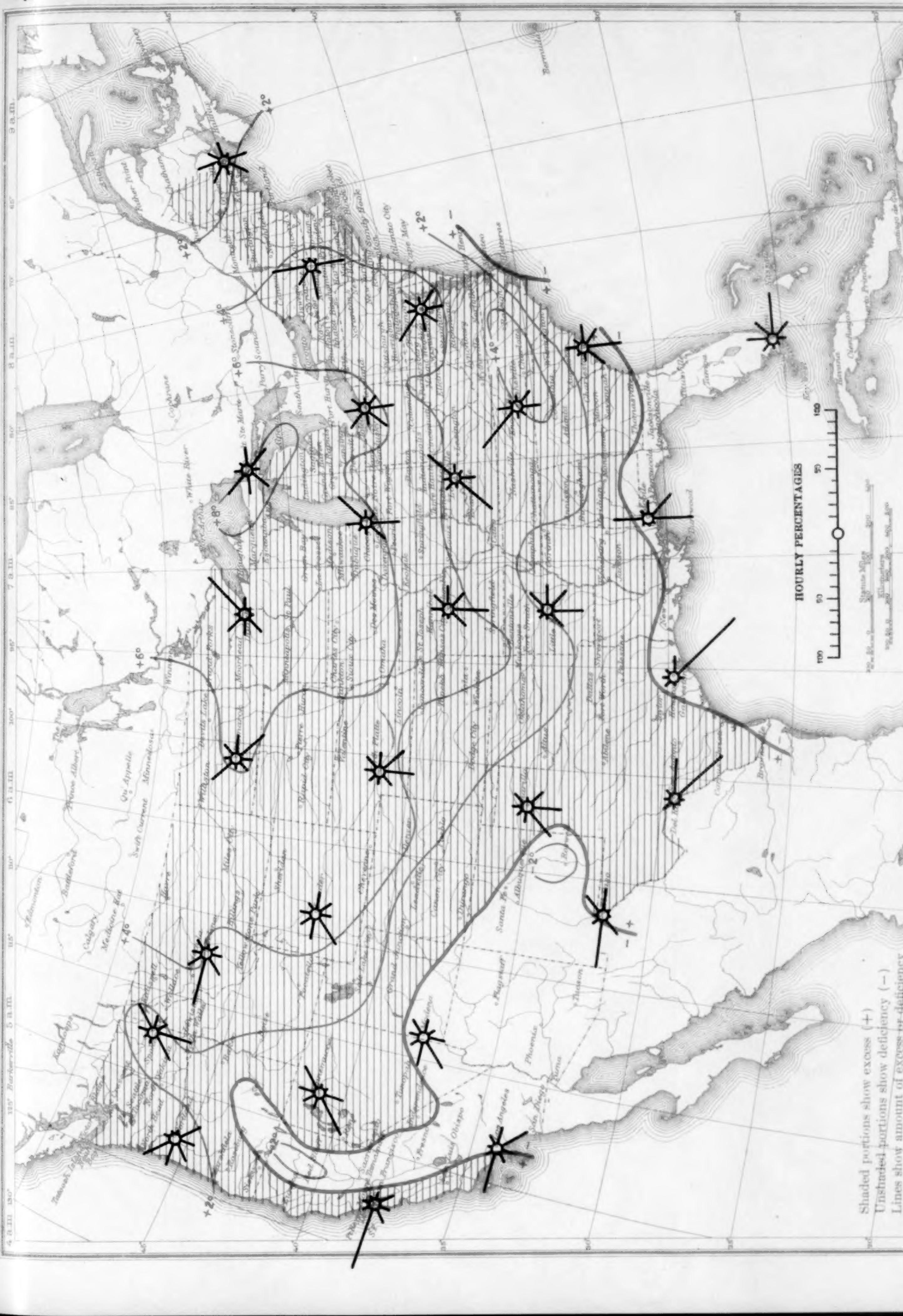
POSITIONS, AREAS, AND COUNTS OF SUN SPOTS FOR APRIL 1942—Continued

Date	Eastern standard time		Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate quality	Observatory
				Difference in longitude	Longitude	Latitude	Distance from center of disk				
1942	h	m		°	°	°	°				
Apr. 18	10	8	7420	−68	205	+5	69	24	2	VG	U. S. Naval
			7419	−55	218	−8	55	48	8		
			7418	−52	221	+9	54	12	2		
			7417	−17	256	+14	27	12	4		
			7415	−10	263	−11	11	24	2		
			7416	0	273	−2	3	48	10		
			7412	+12	285	+9	19	48	4		
			7411	+19	292	+16	28	291	23		
			7411	+28	301	+12	33	533	9		
			7413	+34	307	+12	37	338	22		
					(273)	(−5)		1,378	86		
19	10	38	7421	−79	180	+14	79	194	5	VG	Mt. Wilson.
			7420	−55	204	+5	56	73	7		
			7419	−41	218	−9	41	145	17		
			7418	−38	221	+9	42	145	20		
			7417	−4	255	+14	19	48	7		
			7415	+3	262	−11	7	24	3		
			7416	+13	272	−2	13	24	4		
			7412	+26	285	+8	30	194	1		
			7411	+33	292	+16	40	242	20		
			7411	+42	301	+12	46	582	9		
			7413	+48	307	+12	51	291	16		
					(259)	(−5)		1,962	109		
20	10	49	7421	−70	176	+15	73	97	6	G	U. S. Naval.
			7421	−62	184	+18	65	194	2		
			7420	−40	206	+5	37	24	3		
			7419	−27	219	−8	27	145	19		
			7418	−24	222	+9	28	145	15		
			7417	+10	256	+14	22	48	16		
			7412	+39	285	+8	41	194	1		
			7411	+46	292	+16	50	97	10		
			7411	+55	301	+12	57	582	13		
			7413	+60	306	+12	62	242	8		
					(246)	(−5)		1,768	93		
21	10	18	7421	−56	177	+15	60	97	9	VG	Do.
			7421	−48	185	+18	52	194	4		
			7420	−23	210	+5	23	24	5		
			7419	−13	220	−8	13	436	31		
			7418	−10	223	+9	17	145	15		
			7417	+23	256	+15	31	97	18		
			7422	+42	275	−3	42	24	3		
			7412	+51	284	+8	53	194	1		
			7411	+59	292	+16	62	73	5		
			7411	+68	301	+12	70	533	10		
			7413	+72	305	+12	74	242	5		
					(233)	(−5)		2,059	106		
22	10	44	7421	−40	180	+15	45	97	10	VG	Do.
			7421	−34	186	+7	36	242	7		
			7420	−8	212	+7	14	24	7		
			7419	+1	221	−8	3	436	30		
			7418	+4	224	+10	16	242	22		
			7417	+37	257	+14	41	145	21		
			7422	+56	276	−3	56	48	8		
			7412	+64	284	+8	66	194	1		
			7411	+71	291	+16	73	73	5		
			7411	+82	302	+12	82	533	3		
					(220)	(−5)		2,034	114		
23	11	49	7421	−27	179	+15	33	145	12	F	Do.
			7421	−22	184	+17	31	291	5		
			7419	+14	220	−8	14	485	21		
			7418	+17	223	+9	22	242	18		
			7417	+50	256	+14	53	145	13		
			7412	+78	284	+8	79	194	1		
					(206)	(−5)		1,502	70		
Apr. 24	10	52	7421	−13	180	+15	25	145	21	VG	U. S. Naval.
			7421	−9	184	+17	23	339	5		
			7419	+28	221	−9	28	436	22		
			7418	+31	224	+9	33	339	20		
			(*)	+52	245	+11	55	12	3		
			7417	+64	257	+16	68	48	4		
					(193)	(−5)		1,319	75		
25	9	25	7423	−68	113	+10	70	48	5	VG	Mt. Wilson.
			7421	0	181	+15	20	145	12		
			7421	+4	185	+17	22	339	8		
			7419	+43	224	−9	43	436	22		
			7418	+45	226	+8	48	485	21		
			7417	+76	257	+16	78	48	1		
					(181)	(−5)		1,501	69		
26	11	8	7423	−53	114	+10	55	48	3	F	U. S. Naval.
			7427	−51	116	−6	51	48	7		
			7426	+6	173	−14	10	12	2		
			7421	+13	180	+15	24	48	6		
			7421	+18	185	+16	28	291	7		
			7425	+34	201	+3	36	12	2		
			7424	+37	204	+13	42	24	2		
			7419	+50	217	−9	50	145	9		
			7418	+58	225	+8	60	533	7		
			7419	+60	227	−8	60	194	5		
					(167)	(−5)		1,355	50		
27	10	25	7428	−40	114	+12	44	12	3	VG	Do.
			7423	−39	115	+10	42	48	8		
			7427	−38	116	−6	38	97	6		
			7426	+19	173	−13	21	73	5		
			7421	+27	181	+14	33	48	4		
			7421	+30	184	+16	36	291	8		
			7425	+47	201	+3	49	24	2		
			7424	+51	205	+13	54	24	2		
			7419	+70	224	−9	70	291	12		
			7418	+71	225	+8	73	533	7		
					(154)	(−5)		1,441	57		
28	11	25	7428	−27	113	+13	32	48	7	F	Do.
			7423	−25	115	+10	29	97	5		
			7427	−24	116	−6	24	97	3		
			7426	+32	172	−13	33	145	5		
			7421	+44	184	+16	49	291	8		
			7419	+80	220	−9	80	242	2		
			7418	+80	220	+9	80	242	1		
					(140)	(−4)		1,162	31		
29	10	53	7429	−84	43	−9	84	242	1	F	Do.
			7428	−13	114	+12	20	97	6		
			7423	−11	116	+10	18	194	13		
			7427	−10	117	−6	10	73	2		
			7426	+46	173	−14	47	145	9		
			7421	+58	185	+16	60	291	4		
					(127)	(−4)		1,042	35		
30	10	30	7429	−71	43	−9	71	242	1	F	Do.
			7428	0	114	+13	17	48	4		
			7423	+2	116	+10	14	145	11		
			7427	+3	117	−6	3	48	2		
			7426	+60	174	−13	13	48	3		
			7421	+71	185	+16	73	291	3		
					(114)	(−4)		822	24		

Mean daily area for 28 days=1,054.

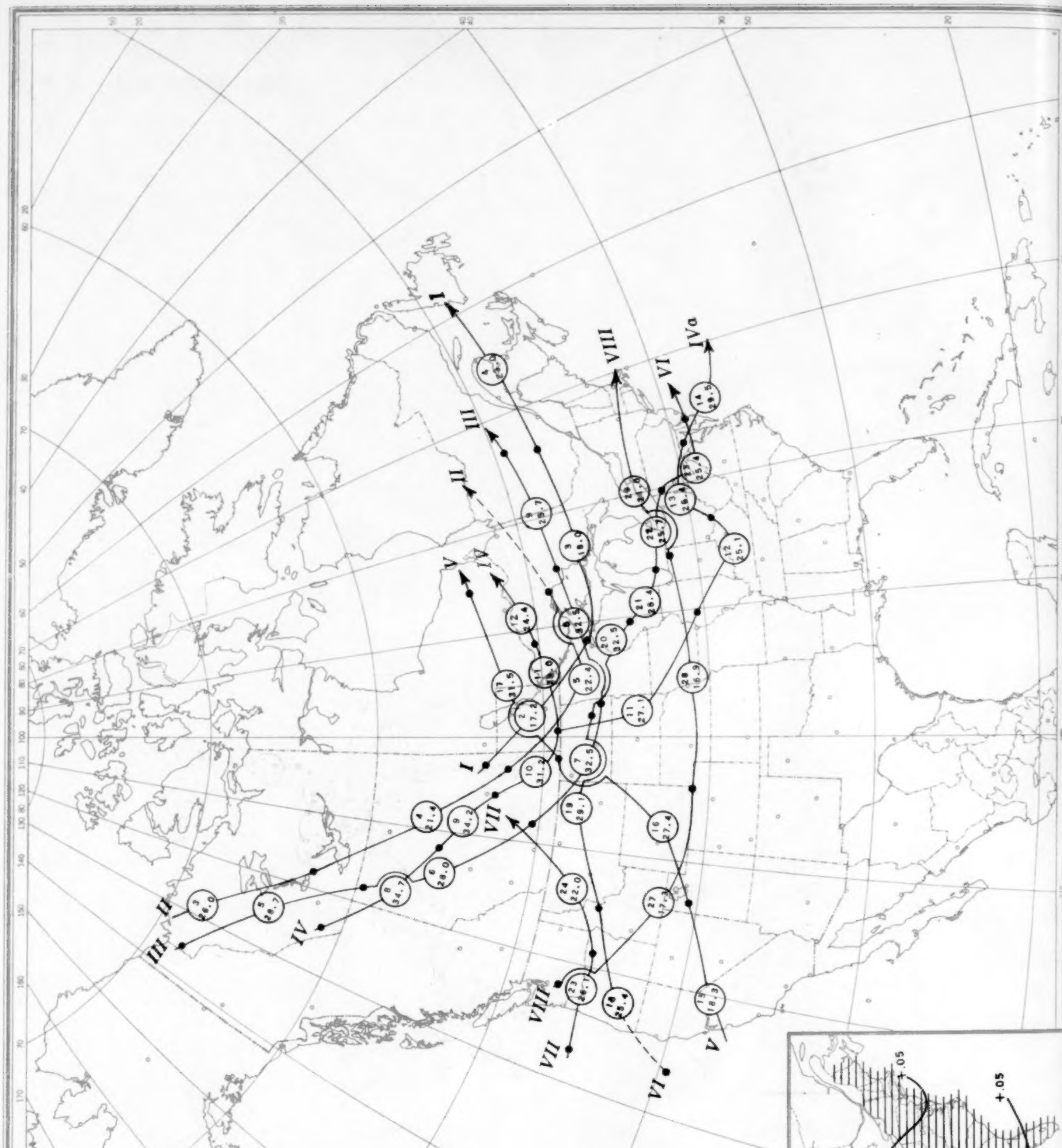
(*)Not numbered.
VG=very good; G=good; F=fair; P=poor.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, April 1942



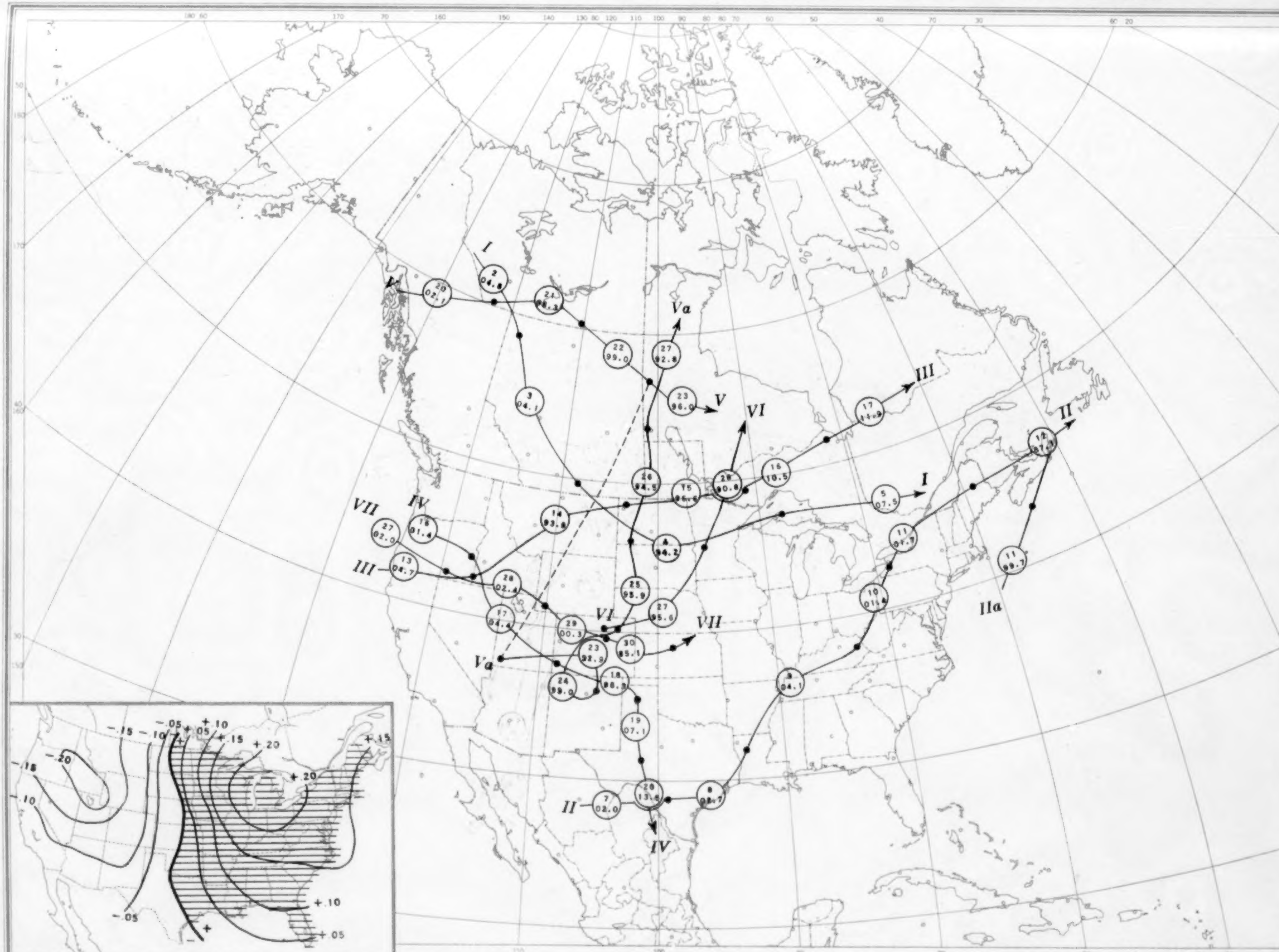
Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency

Chart II. Tracks of Centers of Anticyclones, April 1942. (Inset) Departure of Monthly Mean Pressure from Normal



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, April 1942. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, April 1942

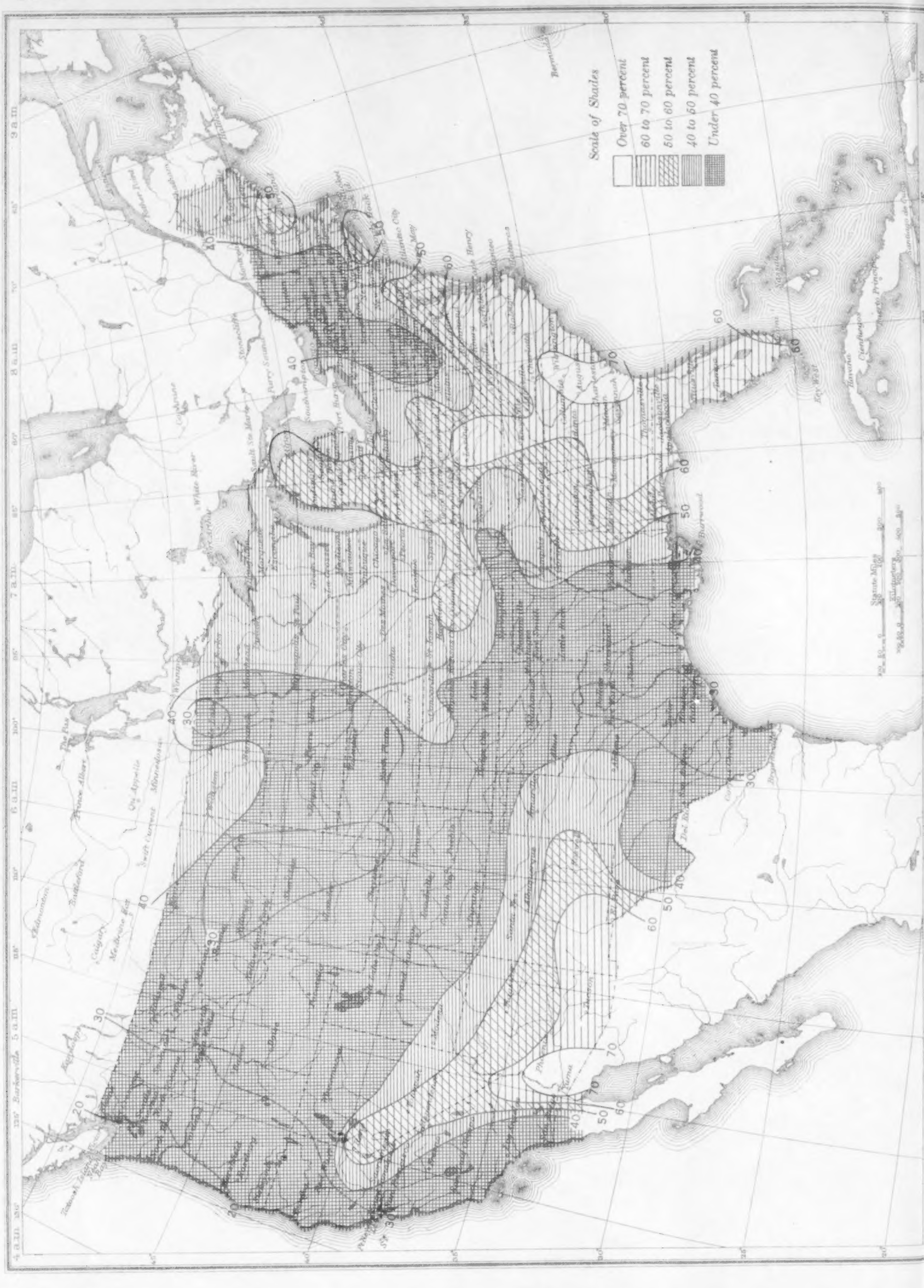


Chart V. Total Precipitation, Inches, April 1942.

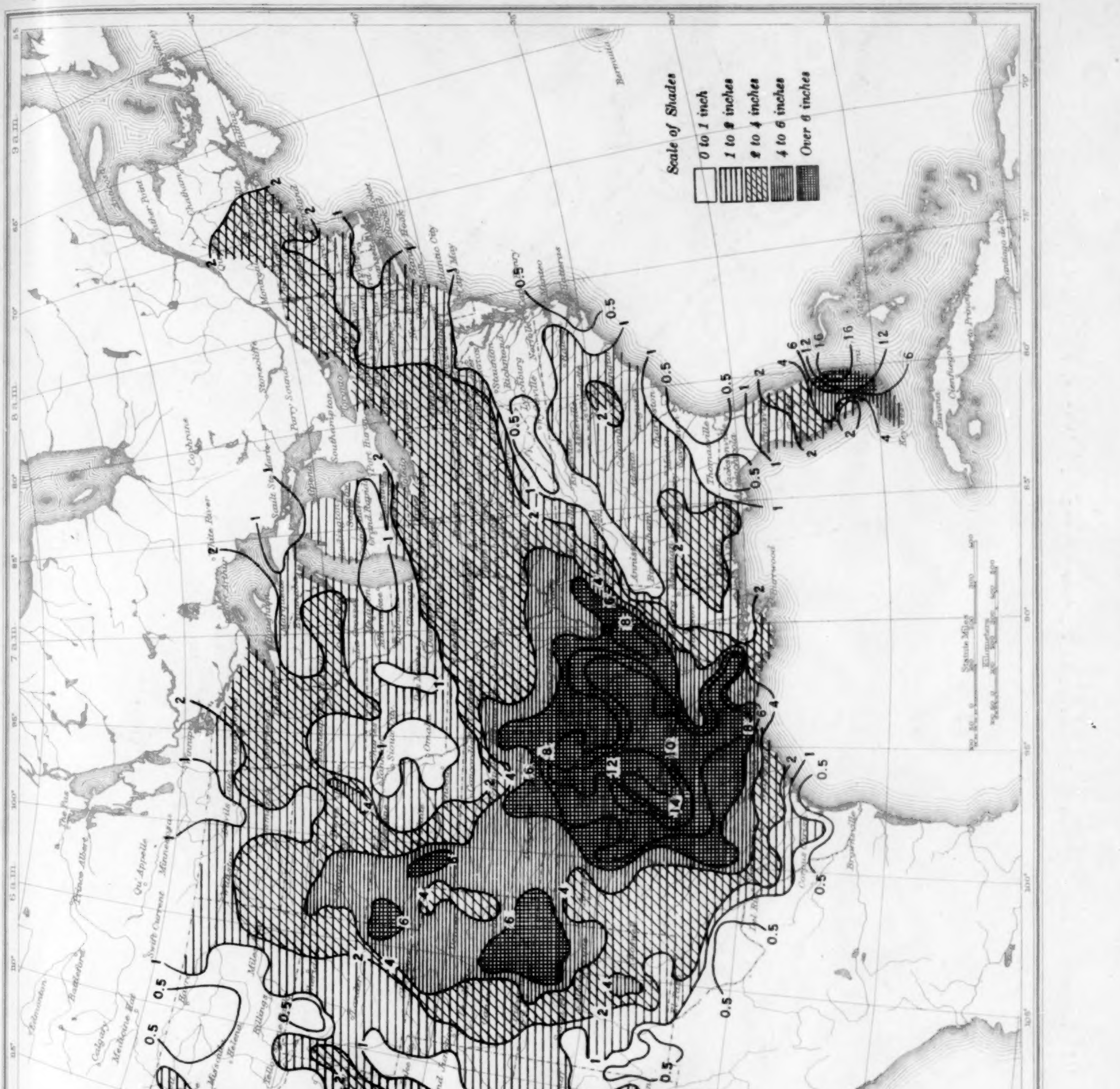


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, April 1942

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) April 1942

Isobars and isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

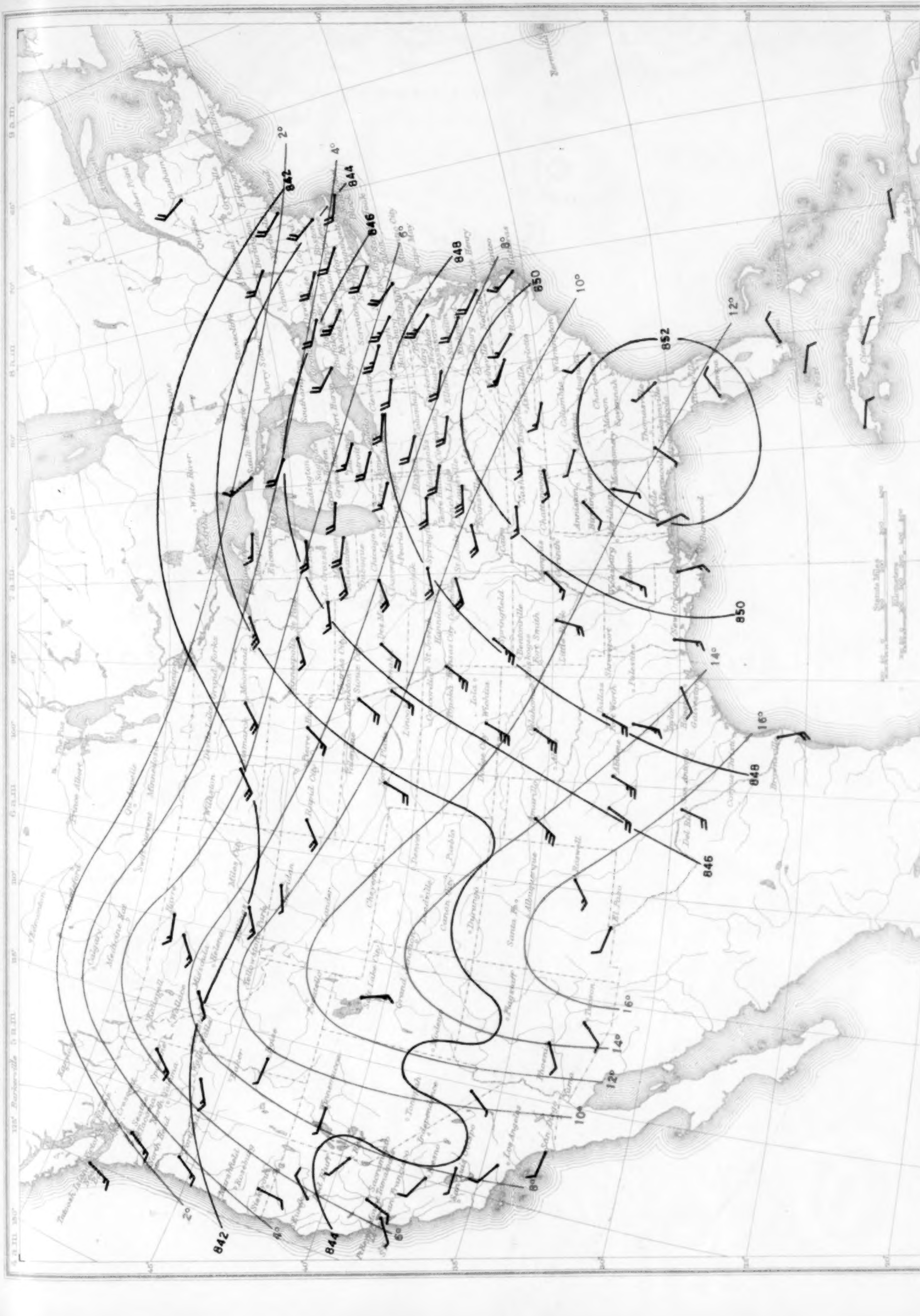


Chart IX. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 a.m. (E.S.T.) for 3,000 Meters (m.s.l.) April 1942

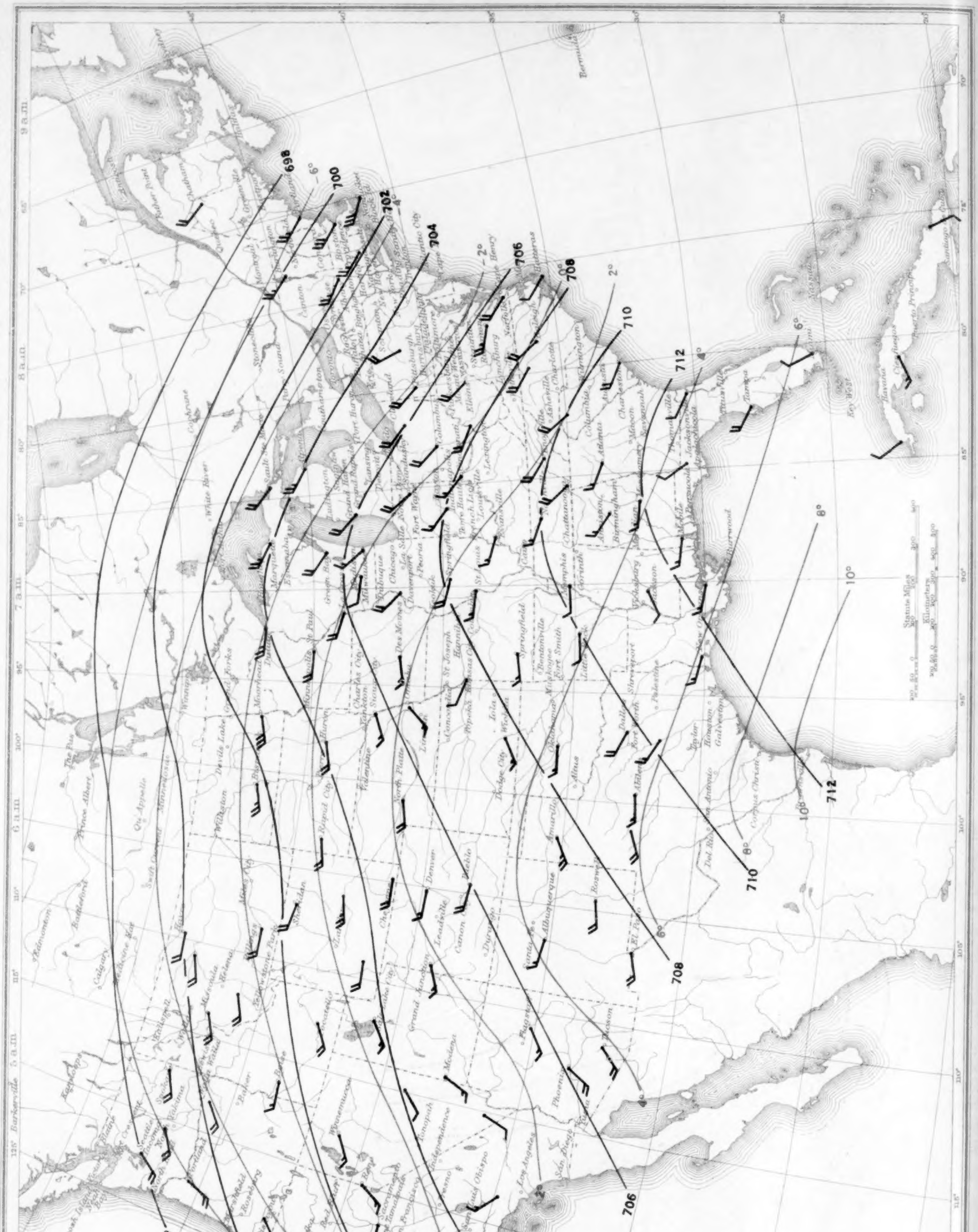


Chart X. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 5,000 Meters (m.s.l.) April 1942

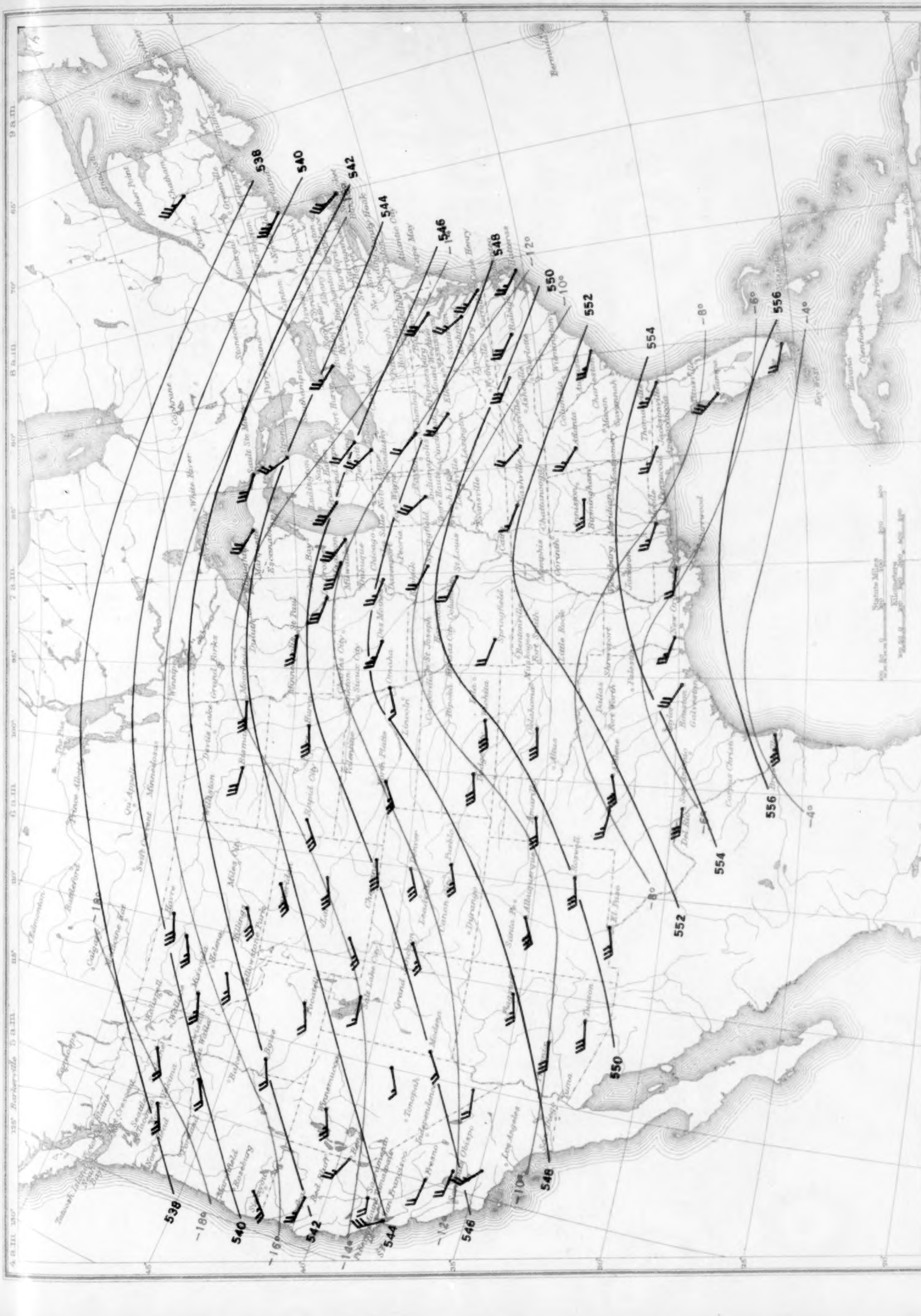


Chart XI. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 10,000 Meters (m.s.l.) April 1942